The EPIC life of a quantitative developer on the trading floor

EP Innovation Centre

Date 22/02/2024

Who am I?

linkedin.com/in/martin-miškuf

Experience + ✎

Head of Analytics and Model Development London Branch
EP Commodities, a.s. · Full-time
Apr 2022 - Present · 1 yr 11 mos
London, England, United Kingdom

EP Commodities specializes in the trading of energy commodities, transit and storage capacities. We deal with transactions in natural gas, power, emissions allowances, coal and structural products like spreads acr …see more

Developer
Gazprom Marketing & Trading
Aug 2018 - Mar 2022 · 3 yrs 8 mos
London, United Kingdom

Developer, Data & Analytics, Gazprom Marketing & Trading, London, United Kingdom
Main responsibilities:…   …see more

Ph.D. Student
The Technical University of Košice
Sep 2014 - Jun 2018 · 3 yrs 10 mos
Košice, Slovakia

The team of Intelligent Cybernetics Systems, Department of Cybernetics and Artificial Intelligence, Faculty of electrical engineering and informatics…   …see more

Department of Cybernetics and Artificial Intelligence
stránka Katedry Kybernetiky a Umelej Inteligencie na TU Košice
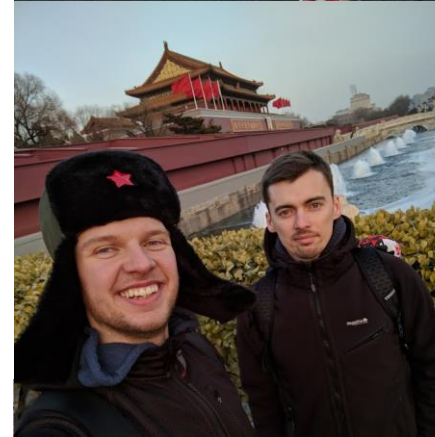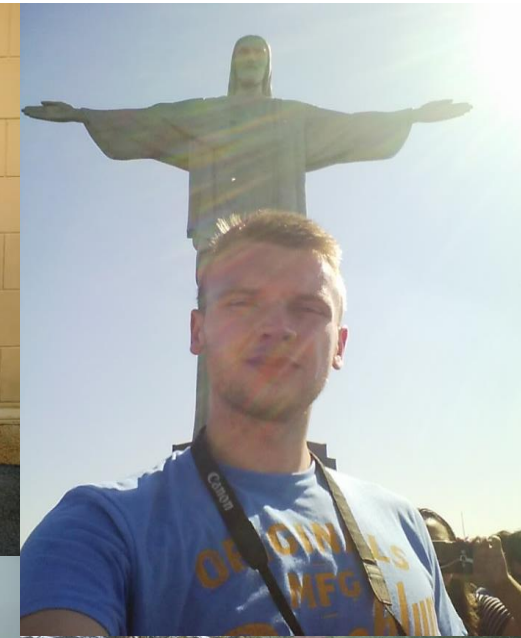
Agenda

❑ Introduction to EP Holding

❑ Understanding Commodity Trading and Fundamental Analytics

❑ Exploring the EPIC Life of a Quantitative Developer

  ▪ Collaboration with Traders: Daily Standups and Kanban

  ▪ Transitioning from Tactical to Production Solutions

  ▪ Introduction to Cloud-Based Python Analytics Platform

❑ Challenges and Future Trends in Commodity Trading

❑ Aspiring to Become an **EPIC** Quantitative Developer

❑ Q&A Session
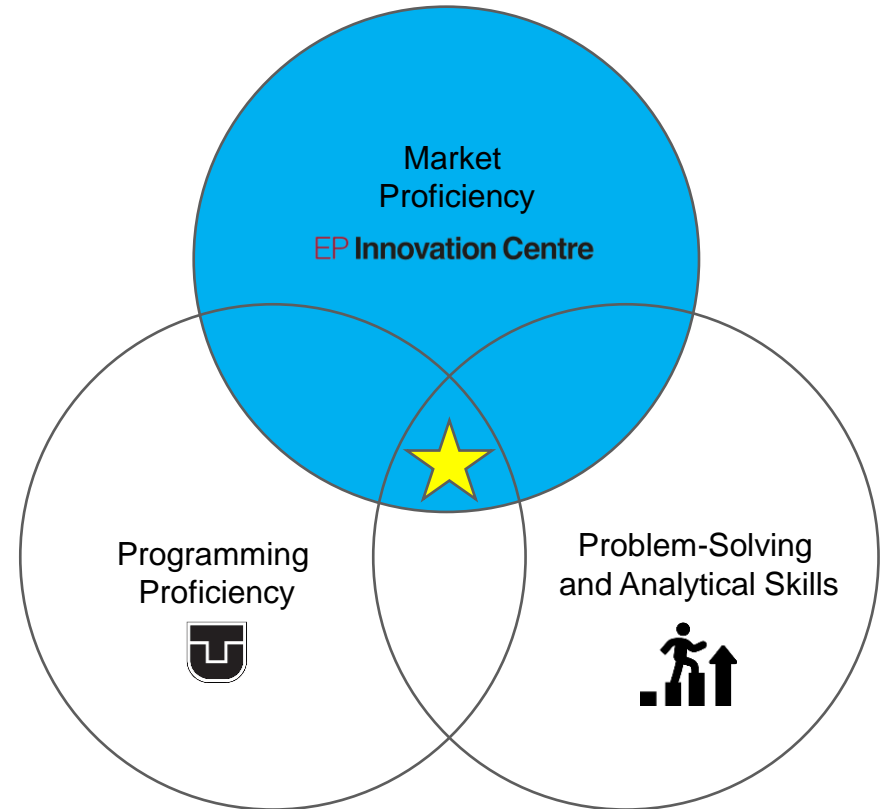
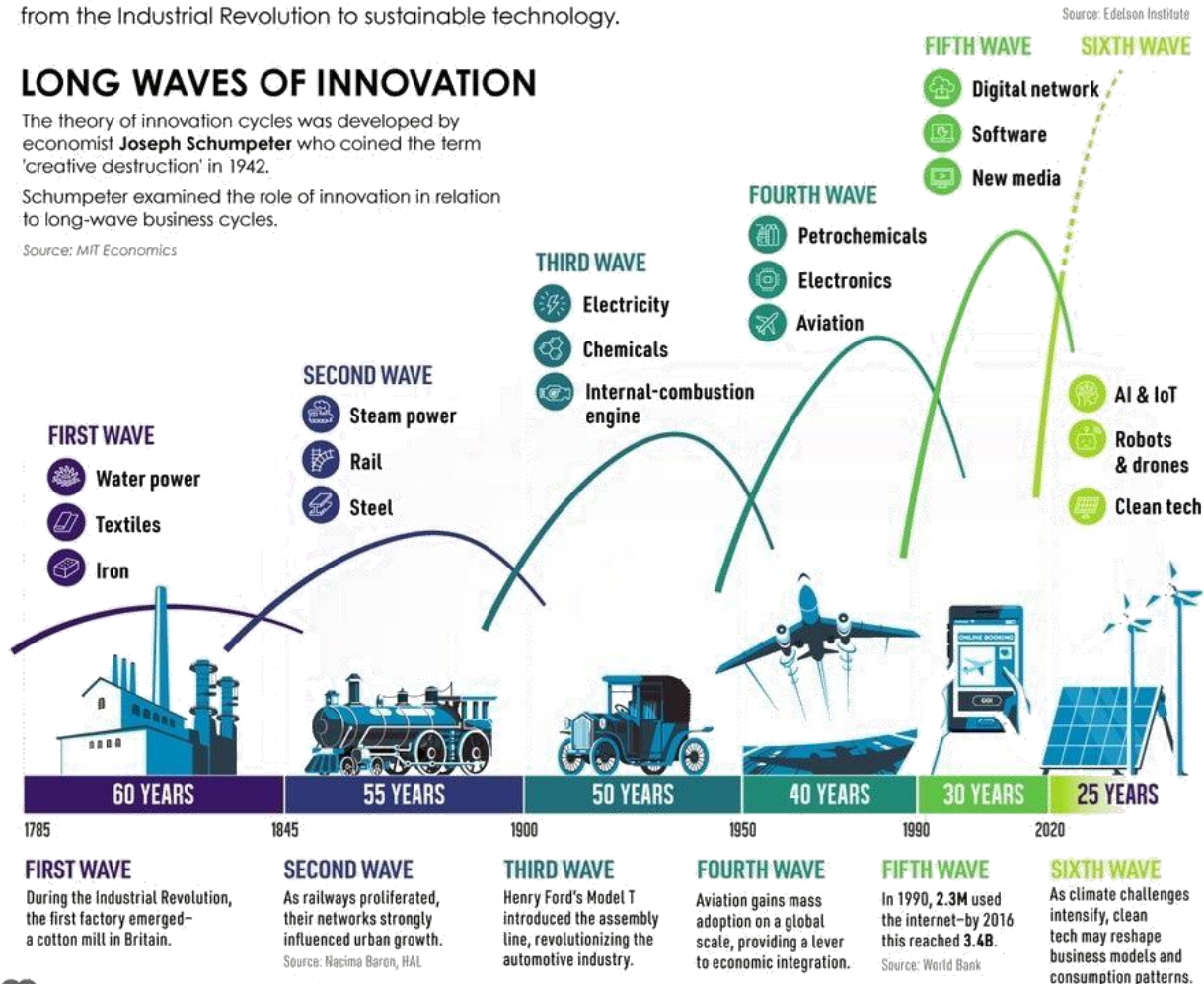# World is changing fast

The History of
INNOVATION CYCLES

Below, we show waves of innovation across 250 years, from the Industrial Revolution to sustainable technology.

Source: Edelson Institute

LONG WAVES OF INNOVATION

The theory of innovation cycles was developed by economist **Joseph Schumpeter** who coined the term 'creative destruction' in 1942.

Schumpeter examined the role of innovation in relation to long-wave business cycles.

Source: MIT Economics

FIFTH WAVE   **SIXTH WAVE**
- Digital network
- Software
- New media

FOURTH WAVE
- Petrochemicals
- Electronics
- Aviation

THIRD WAVE
- Electricity
- Chemicals
- Internal-combustion engine

SECOND WAVE
- Steam power
- Rail
- Steel

FIRST WAVE
- Water power
- Textiles
- Iron

- AI & IoT
- Robots & drones
- Clean tech

60 YEARS	55 YEARS	50 YEARS	40 YEARS	30 YEARS	25 YEARS
1785	1845	1900	1950	1990	2020

FIRST WAVE
During the Industrial Revolution, the first factory emerged– a cotton mill in Britain.

SECOND WAVE
As railways proliferated, their networks strongly influenced urban growth.
Source: Nacima Baron, HAL

THIRD WAVE
Henry Ford's Model T introduced the assembly line, revolutionizing the automotive industry.

FOURTH WAVE
Aviation gains mass adoption on a global scale, providing a lever to economic integration.

FIFTH WAVE
In 1990, **2.3M** used the internet–by 2016 this reached **3.4B**.
Source: World Bank

SIXTH WAVE
As climate challenges intensify, clean tech may reshape business models and consumption patterns.

Who we are

EP **Power Europe**

Gas Transmission
Operator of the biggest pipeline in Europe and critical gas infrastructure for Western, Central and Southern Europe
Read more

Gas & Power Distribution
Key strategic gas infrastructure operator & relevant power distributor in Slovakia and the Czech Republic
Read more

Heat Infra
A leading supplier of heat in the Czech Republic, serving hundreds of thousands of households and commercial customers
Read more

Gas Storage
A major operator of natural gas storage capacity in the region of Slovakia, Czech Republic and Austria.
Read more

Renewables
Producer of energy from a balanced mix of renewable energy sources
Read more

Power Generation
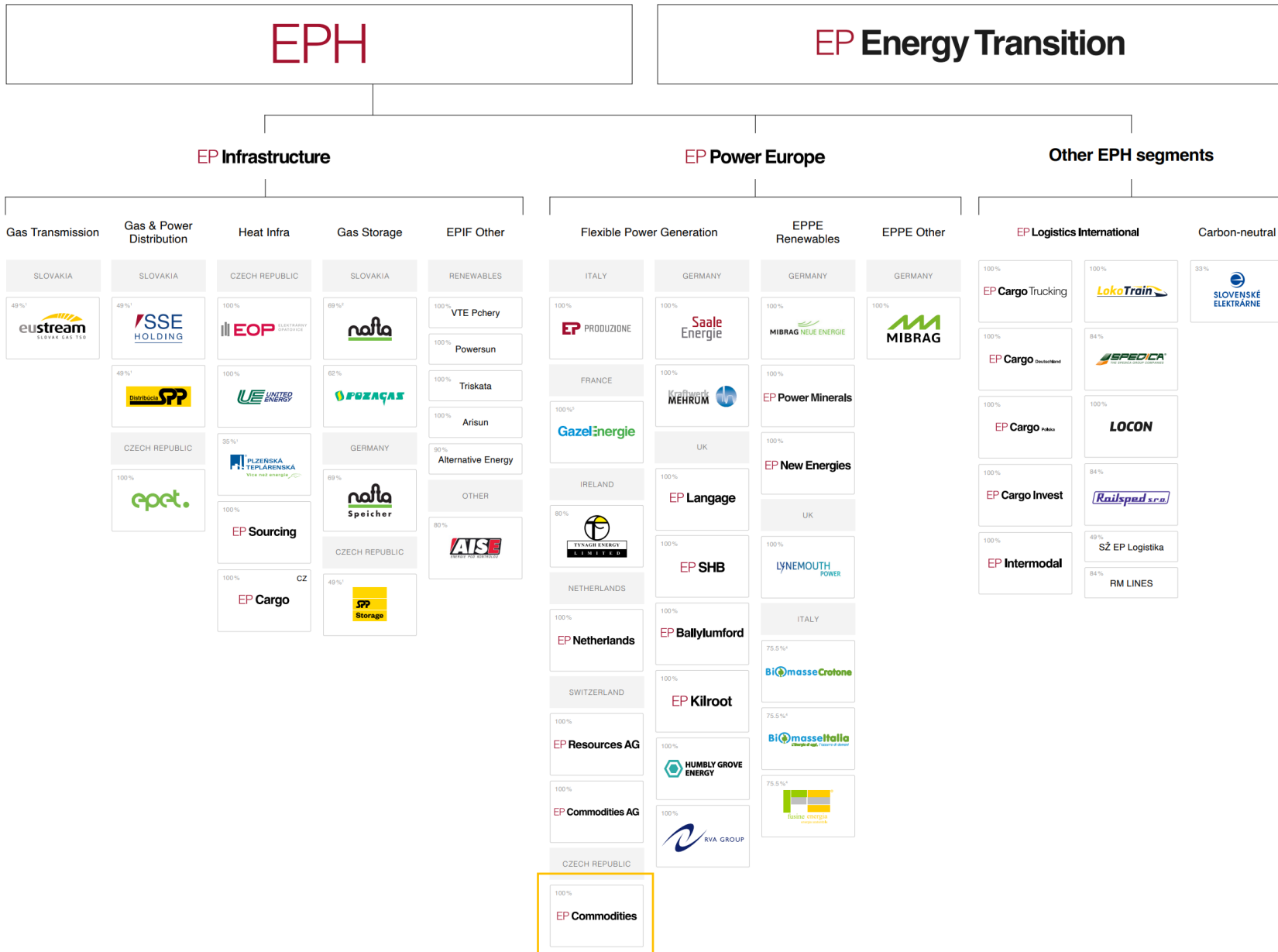One of Europe's leading producers of energy from traditional sources
Read more

Mining
Operator of the second largest mining company in Germany
Read more

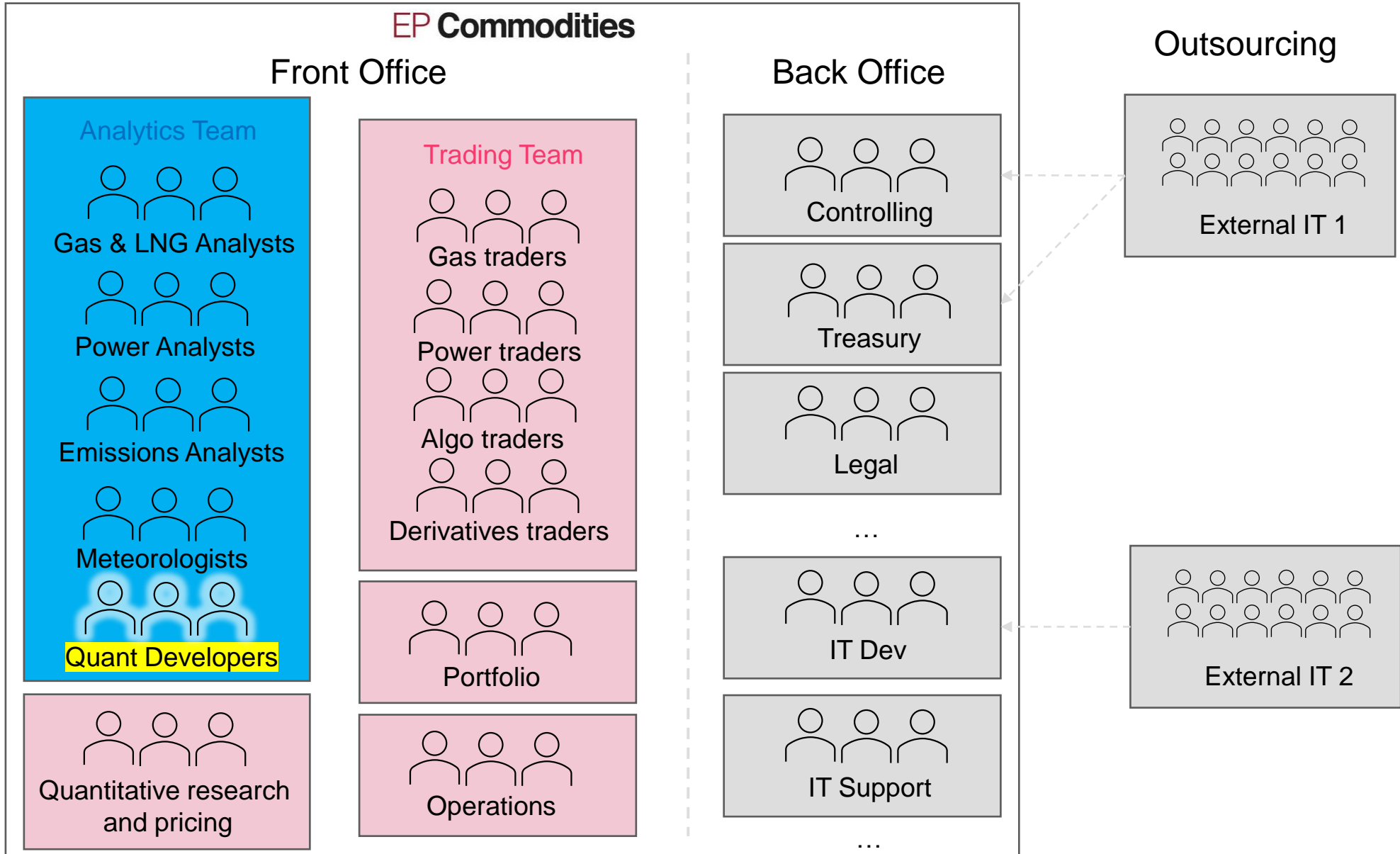Gas   Lignite   Hard coal   Wind   Biomass   Sun   Trading   Residency

✔ Czech Republic   ✔ France   ✔ Germany   ✔ Ireland   ✔ Italy   ✔ Netherlands   ✔ Switzerland   ✔ United Kingdom

EP **Innovation Centre**
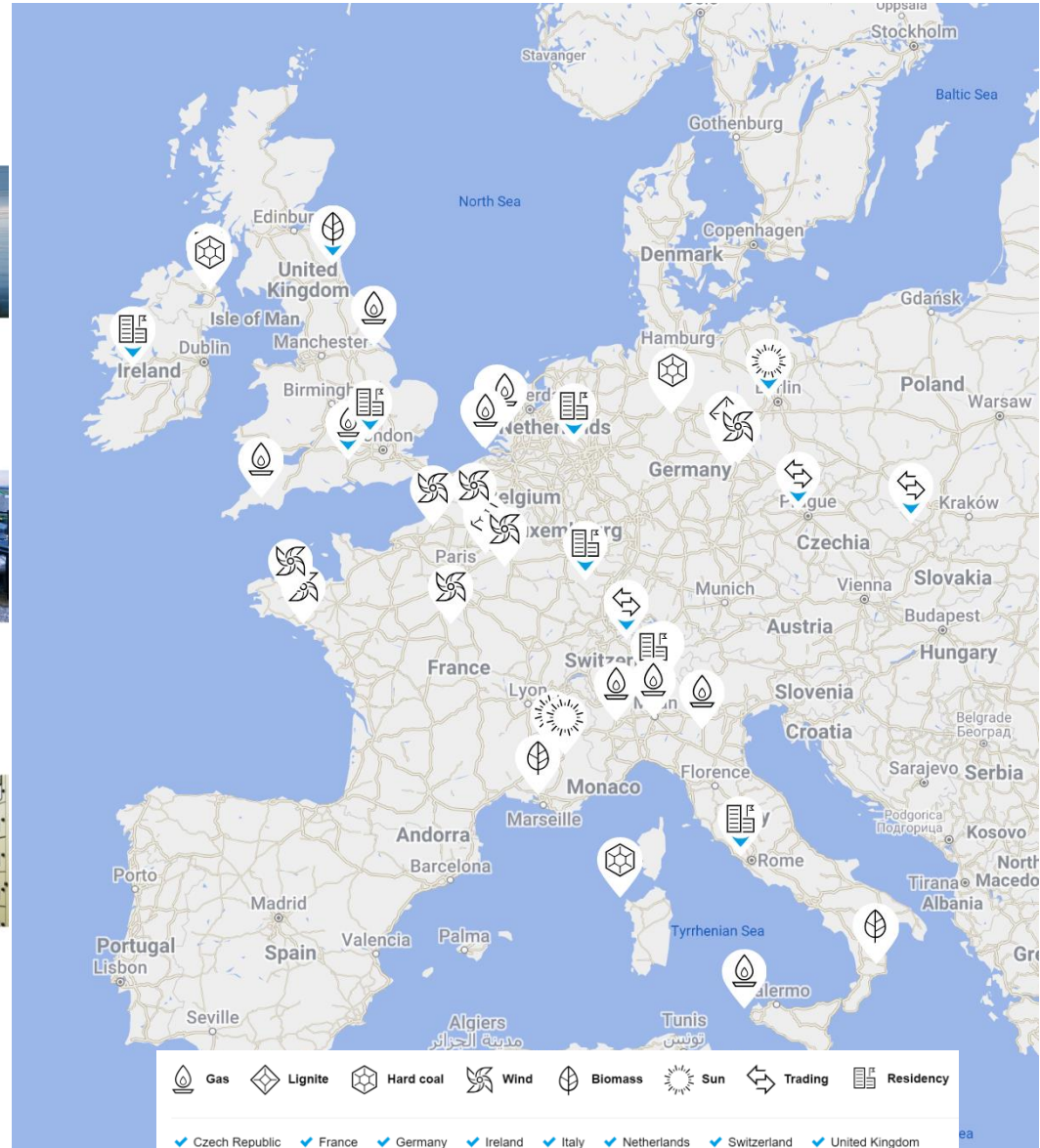
Company Structure

The most important slide – Quant dev vs. Delivery center dev

EP **Commodities**

Outsourcing

Front Office

Analytics Team

Gas & LNG Analysts

Power Analysts

Emissions Analysts

Meteorologists

Quant Developers

Quantitative research and pricing

Trading Team

Gas traders

Power traders

Algo traders

Derivatives traders

Portfolio

Operations

Back Office

Controlling

Treasury

Legal

…

IT Dev

IT Support

…

External IT 1

External IT 2

Quick introduction to the energy commodity analytics & trading

There are three ways to make a living in this business: **be first; be smarter; or cheat**.
Now, I don't cheat. And although I like to think we have some pretty smart people in this building,
it sure is a hell of a lot easier to just be first.

Gas market
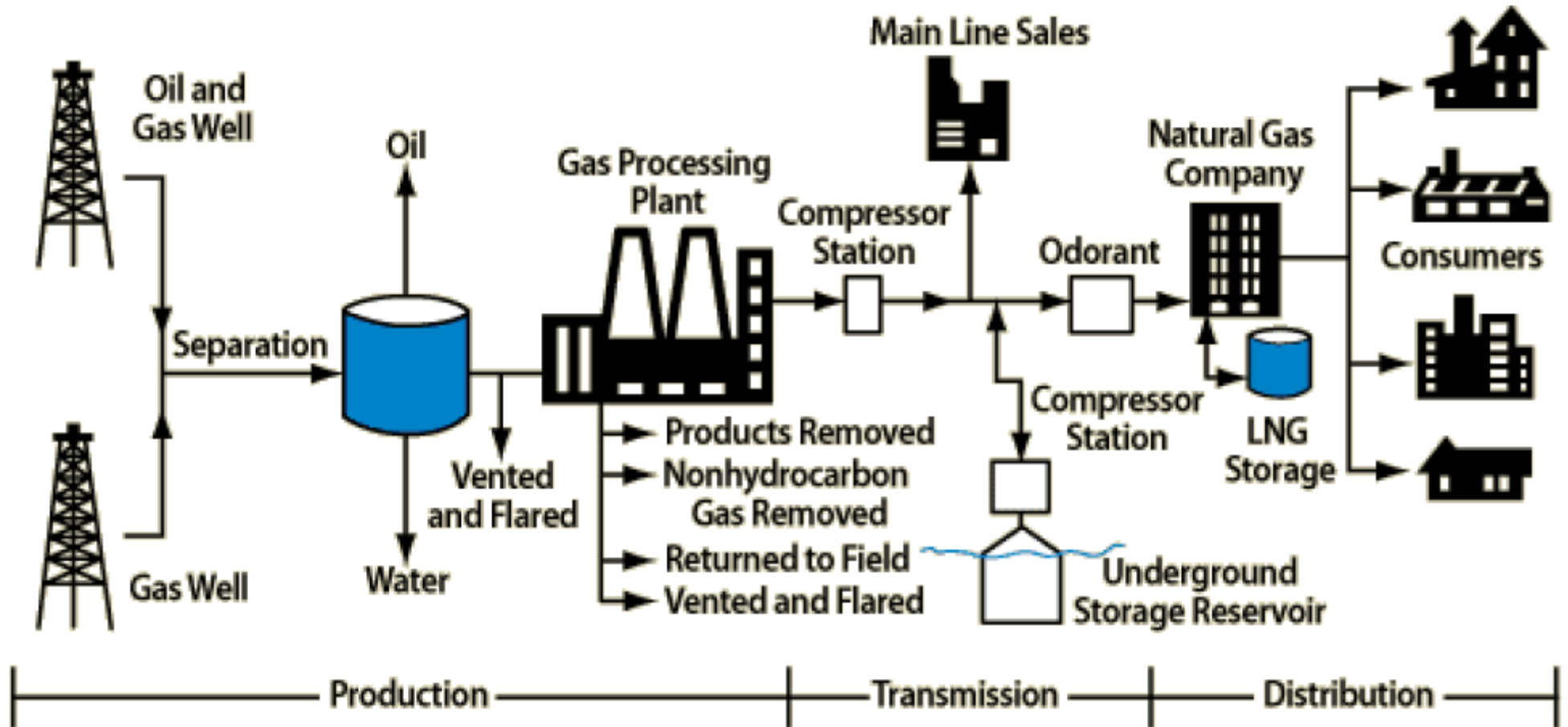
Demand + Poduction + Border Flows + LNG + Storage = Balance
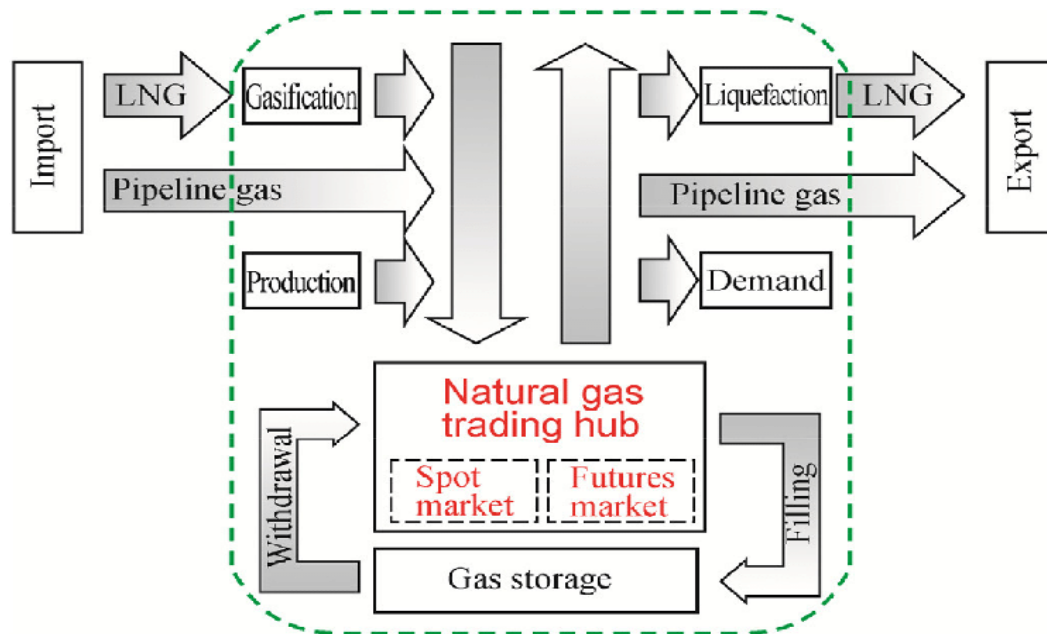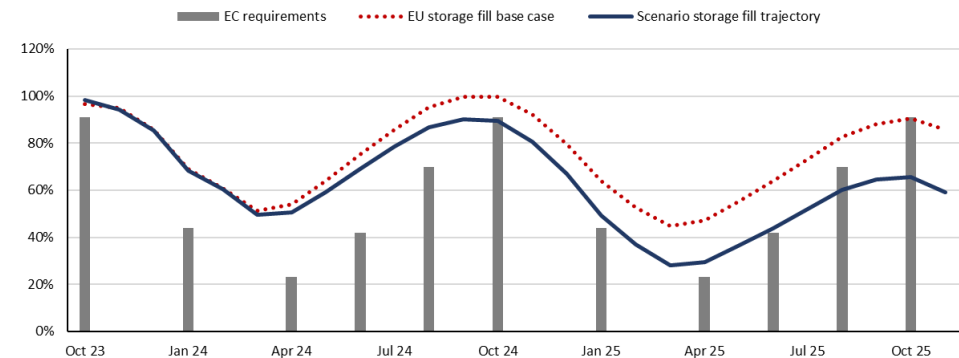Storage + Balance = IMBALANCE STORAGE

https://www.aemc.gov.au/energy-system/gas/gas-supply-chain

EU Gas Hubs and imports

https://www.bruegel.org/dataset/european-natural-gas-imports
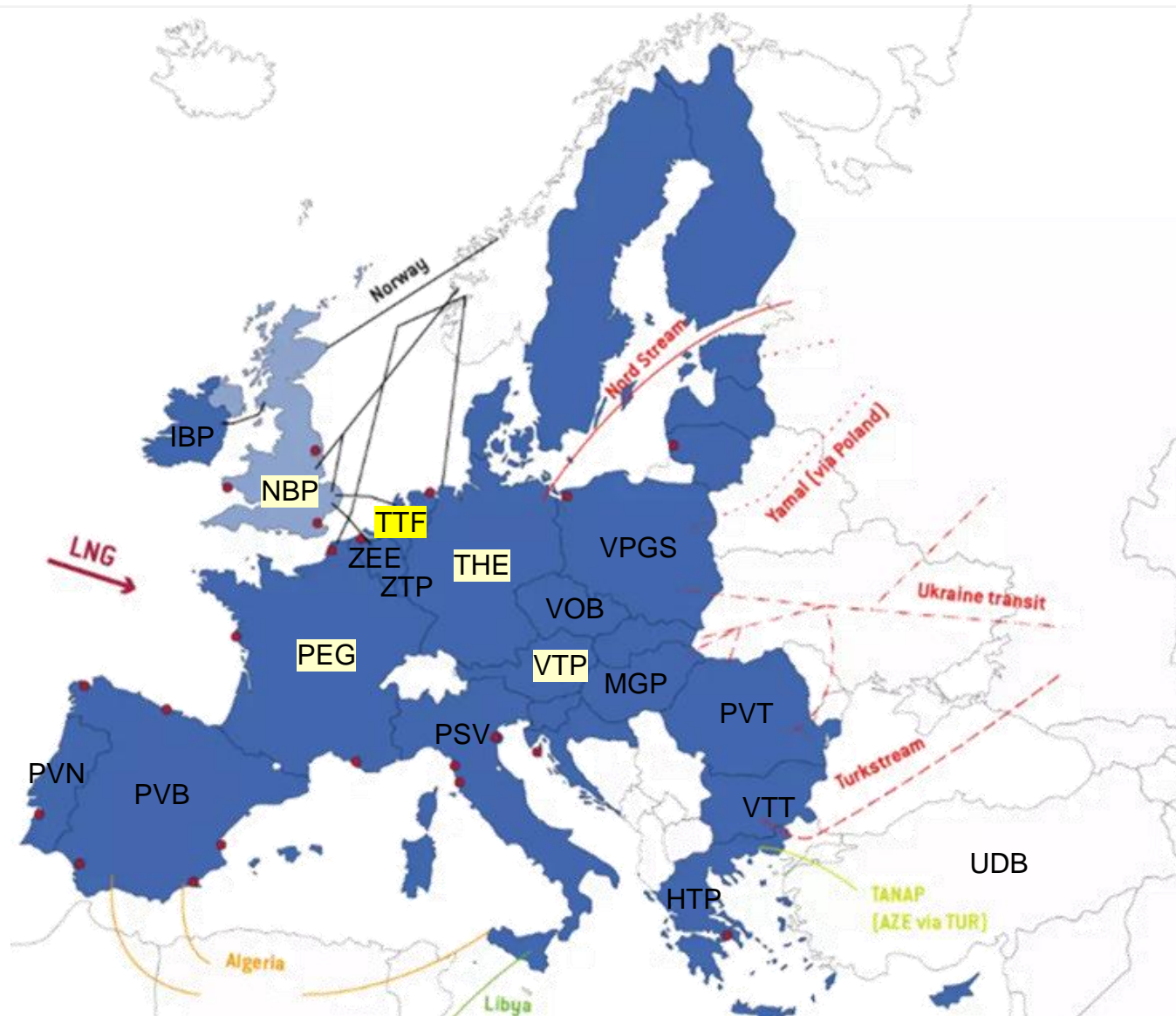
Gas market hubs and modelling S&D

How will market look considering current prices -> Supply – Demand = Imbalance -> Storage?

https://www.researchgate.net/figure/Schematic-diagram-of-the-structure-of-natural-gas-trading-market_fig7_274736736

Name	Supply								Border flows									Demand				Storage			
	RUSSIA	NORWAY	ALGERIA	LIBYA	AZERI	PRODUCTION	LNG	Total Supply	SLOVENIA	HUNGARY	SWITZERLAND	POLAND	SPAIN	DENMARK	IRELAND	LUXEMBOURG	Total Border	Total Demand	Linepack	Storage	Imbalance	Storage	Imbalance Storage Scenario	Imbalance Storage (base case)	EC requirements
Variable	netFlow	netFlo	netFl	netFl	netFl	netFlow	withdraw	netFlow	netFl	netFlo	netFlo	netFlo	netFlo	netFlo	netFlo	netFl	netFlow	netFlow	netln	netlnjecti	netFlow	fullness	fullness	fullness	fullness
2Y_Min	17	148	42	4	23	123	196	592	-5	-19	-14	-30	-14	-10	-20	-3	-68	-1279	-2	-393	-47	25%	25%	25%	
2Y_Max	230	331	80	9	29	180	345	1105	-2	4	-3	0	20	0	-11	-1	-18	-456	2	473	7	95%	98%	97%	
Oct 23	33	273	57	6	28	132	238	768	-2	3	-6	-2	5	-1	-14	-1	-18	-630	-2	-122	-4	86%	98%	97%	91%
Nov 23	36	302	52	9	28	132	322	882	-3	2	-11	-6	10	-3	-17	-2	-28	-971	0	116	-1	90%	94%	95%	
Dec 23	42	319	55	5	24	137	304	887	-3	4	-14	-3	1	-1	-15	-2	-33	-1096	0	238	-4	86%	85%	86%	
Jan 24	39	314	43	5	27	138	288	854	-3	4	-14	-2	-3	-1	-20	-3	-41	-1279	0	473	7	78%	68%	69%	44%
Feb 24	39	300	51	4	27	134	255	810	-3	2	-11	-3	-1	-3	-16	-2	-36	-1007	0	185	-47	60%	60%	61%	
Mar 24	32	303	65	9	26	128	238	801	-4	-4	-12	-4	-1	-5	-14	-2	-47	-1052	0	-16	-314	54%	50%	51%	
Apr 24	27	284	80	8	27	126	277	830	-4	-3	-8	-4	20	-3	-16	-2	-19	-766	1	-120	-74	54%	50%	54%	23%
May 24	26	280	59	8	25	122	300	819	-2	-3	-6	-1	20	1	-14	-1	-7	-576	1	-164	73	58%	59%	64%	
Jun 24	24	297	62	5	25	116	256	785	-2	-3	-4	-1	14	2	-13	-1	-9	-487	0	-140	148	64%	69%	75%	42%
Jul 24	24	301	56	5	25	120	241	772	-3	-3	-3	-1	11	2	-14	-1	-11	-495	0	-137	128	69%	79%	86%	
Aug 24	14	269	61	3	25	113	214	700	-4	-3	-3	-1	8	0	-14	-1	-17	-454	0	-156	72	74%	87%	95%	70%
Sep 24	14	223	69	6	27	119	198	655	-2	-3	-5	-5	-5	8	-12	-1	-26	-529	-1	-148	-49	79%	90%	100%	
Oct 24	14	287	59	6	28	127	191	713	-3	-6	-7	-5	2	6	-13	-1	-28	-705	-1	-101	-124	84%	89%	100%	91%
Nov 24	24	297	56	9	28	128	247	790	-5	-11	-11	-4	1	3	-14	-1	-42	-1007	-1	108	-152	88%	80%	92%	
Dec 24	24	300	62	9	24	130	260	810	-3	2	-13	-3	7	7	-18	-3	-24	-1163	-2	284	-95	84%	67%	80%	
Jan 25	28	304	50	8	26	126	267	808	-4	3	-14	-5	0	6	-15	-2	-32	-1259	0	422	-61	74%	49%	64%	44%
Feb 25	24	303	57	7	26	127	247	790	-4	-3	-12	-5	3	7	-14	-2	-30	-1135	-1	544	169	59%	37%	53%	
Mar 25	24	303	65	9	26	123	249	799	-4	-15	-11	-4	16	10	-14	-2	-25	-1021	0	446	199	41%	28%	45%	

Legend: EC requirements | EU storage fill base case | Scenario storage fill trajectory

Demand + Production + Border Flows + LNG + Storage = Balance

Storage + Balance = IMBALANCE STORAGE

Power market

1. Generation
The production of electricity from burning fossil fuels, nuclear or renewables

2. Transmission
High voltage bulk carrying of power across country

Grid scale storage

3. Distribution
Lower voltage network

System Operator
Balancing supply and demand

4. Embedded generation
Power stations connected to distribution networks

5. Domestic supply
Retail to households

Industrial and commercial users

Demand – (Wind + Solar) = Residual Load
Demand – (Wind + Solar + Nuclear + Hydro) = Adjusted Residual Load

https://www.energy-uk.org.uk/insights/different-parts-of-the-energy-market/

EU Power market

No effective large-scale storage - Supply must meet Demand
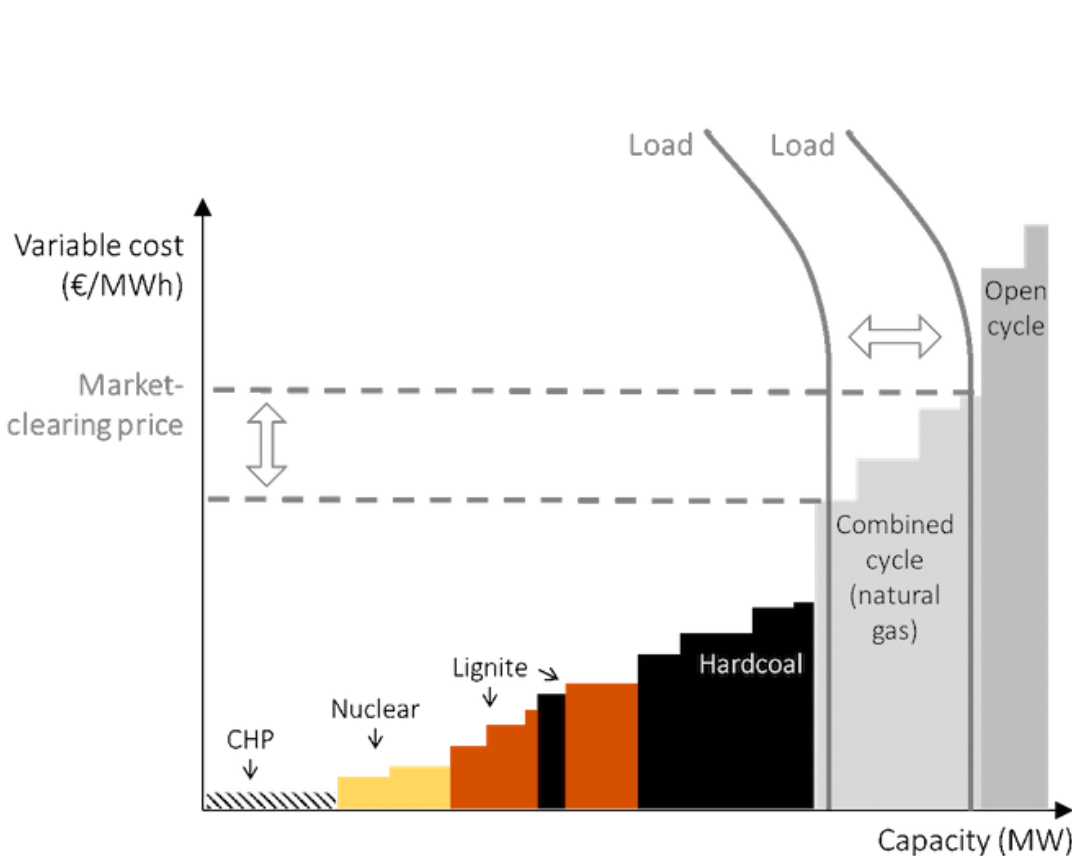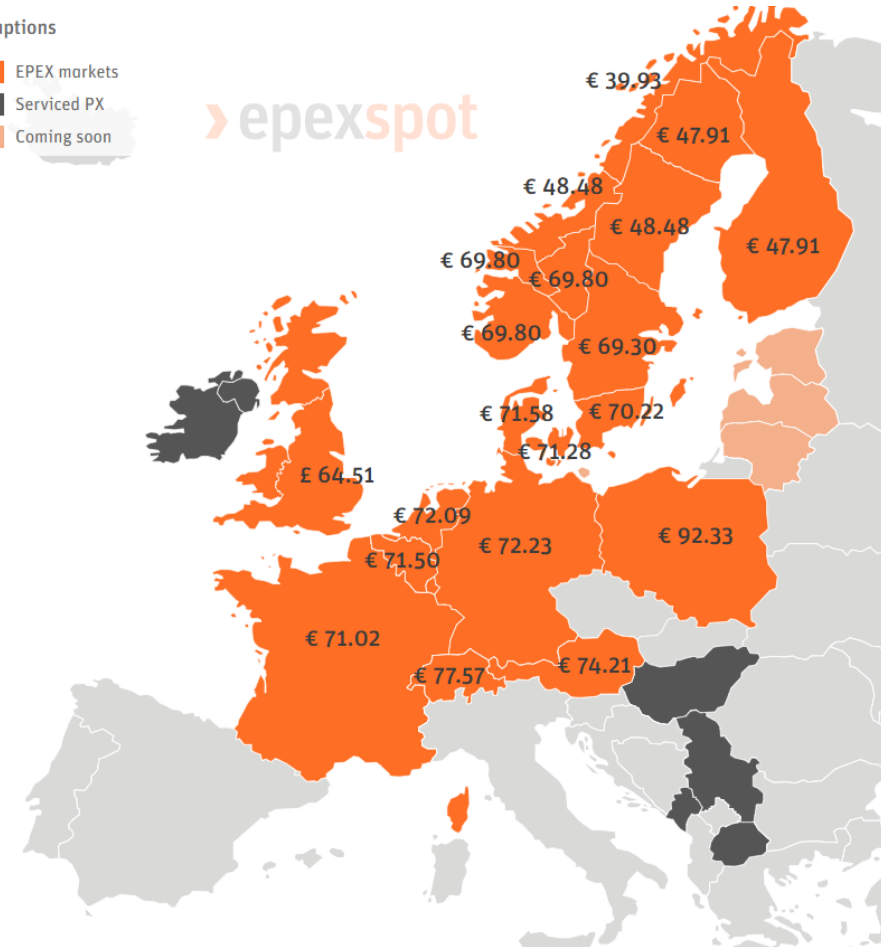
Demand – (Wind + Solar) = Residual Load
Demand – (Wind + Solar + Nuclear + Hydro) = Adjusted Residual Load

https://www.entsoe.eu/data/map/
https://www.epexspot.com/en/market-data

Fundamental analytics of energy markets

Market fundamentals

Power example

	UK	NL	FR	DE
Residual Load (GWh/d)	15	-30	-5	30
Price (EUR/MWh)	70	55	60	90

Gas example

Date	Supply	Demand	Storage	Imbalance
Winter	840	-1060	146	-74
Summer	793	-551	-144	98

Location spreads

€ 71.58   € 70.22
€ 71.28
£ 64.51
€ 72.09
€ 72.23   € 92.33
€ 71.50
€ 71.02
€ 77.57   € 74.21

Time spreads

Arbitrage

Market price

Expectation

Price

Buy now & store it ≈ future price

What about Liquidity and Volatility?

Winter   Summer
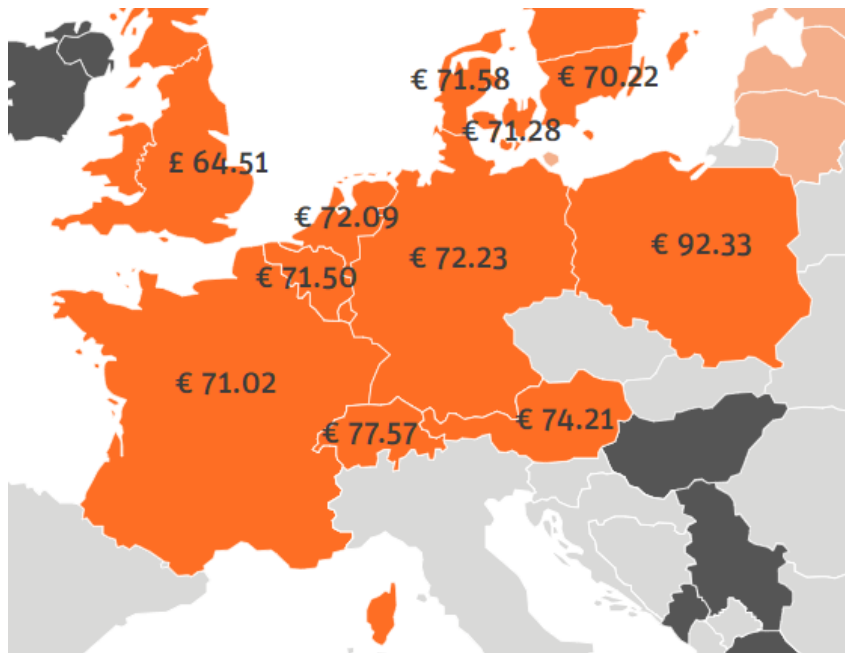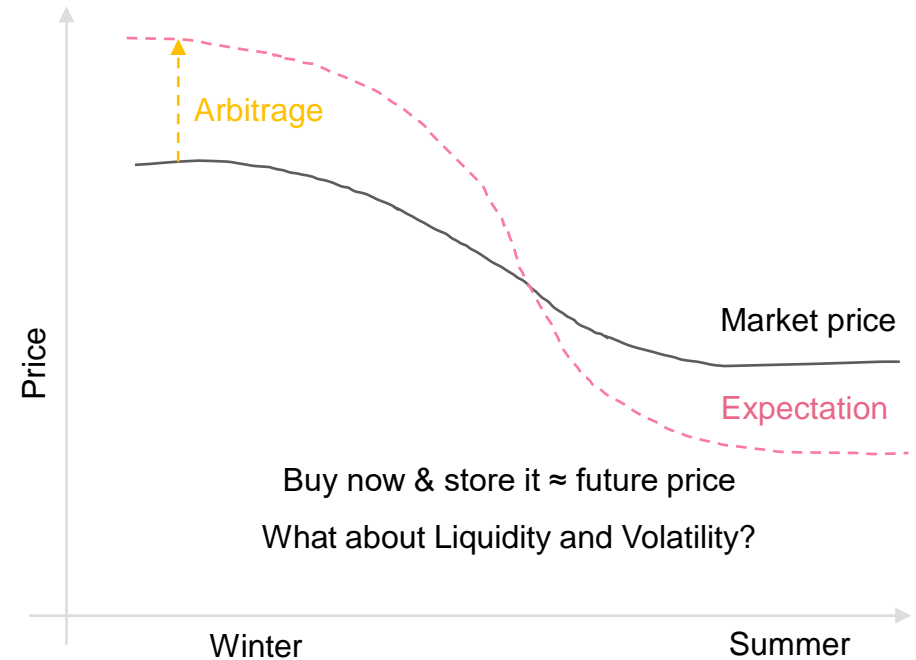
How do we decide: Combination of: **Fundamental Analysis**, Technical Analysis, Open Interest, Commitments of Traders, Option Analysis, …

Products and Pricing

Spot price — Buy or sell an asset immediately at the current market price

VS

Options price — Get the right, but not the obligation, to buy or sell an asset for a set price on a set date

Futures price — Buy or sell an asset for a set price on a future expiry date

Cost = PRICE x UNIT x DAYS(in product) x HOURS

EEX GERMAN POWER FUTURES
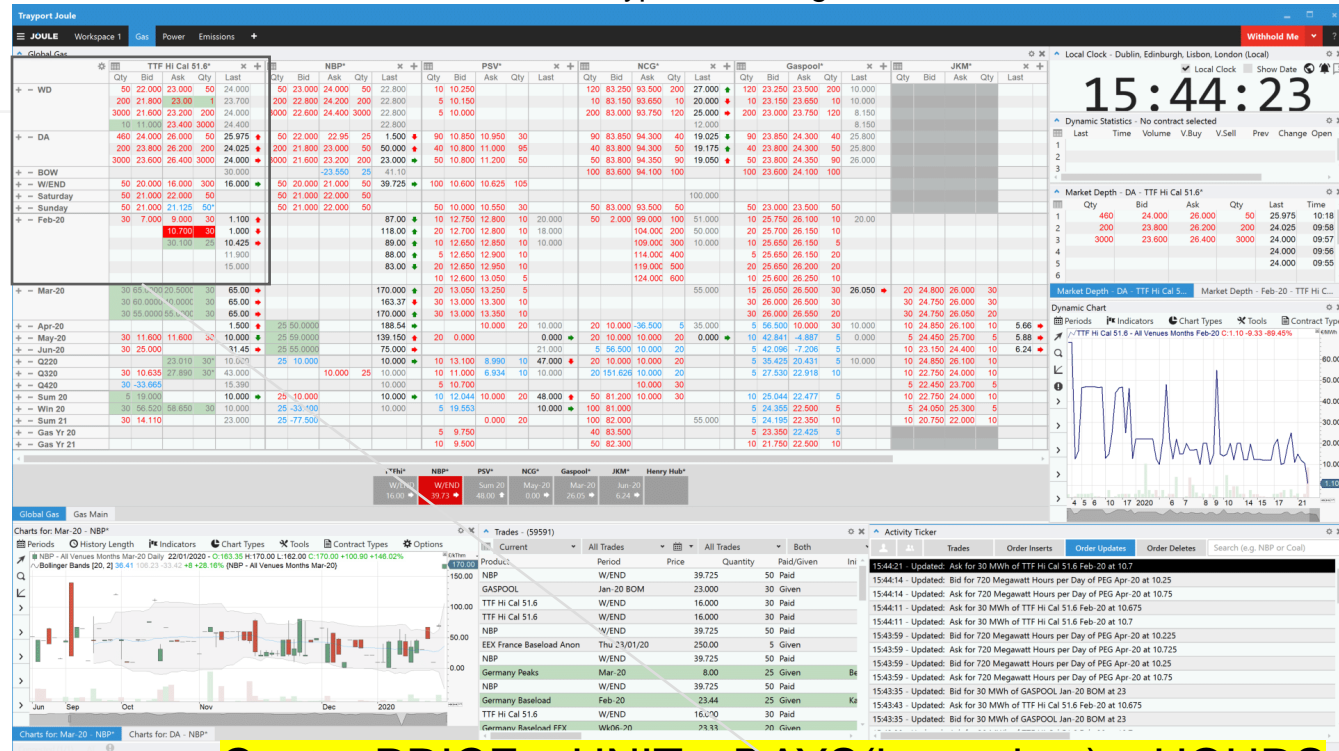
ICE Endex
Dutch TTF Natural Gas Futures
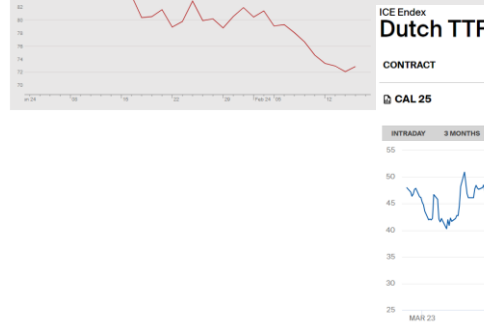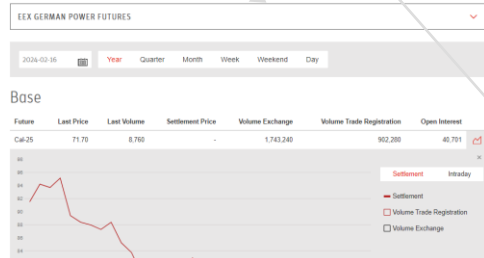
CONTRACT	LAST	TIME(GMT)	% CHANGE	VOLUME
CAL 25	28.325	2/16/2024 12:59 PM	0.000	260

NL GAS (TTF): https://www.ice.com/products/27996665/Dutch-TTF-Natural-Gas-Futures/data?marketId=5733529
DE PWR: https://www.eex.com/en/market-data/power/futures#%7B%22snippetpicker%22%3A%2228%22%7D

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Let's trade

NL Gas (TTF): https://www.tradingview.com/chart/?symbol=NYMEX%3ATTF1%21
DE Power (DEB): https://www.tradingview.com/chart/YvghIZYz/?symbol=NYMEX%3ADEB1%21

EU Gas & Power market

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The EPIC life of a quantitative developer

What my mom thinks I do

What my co-workers think I do

What my friends think I do

What my family thinks I do

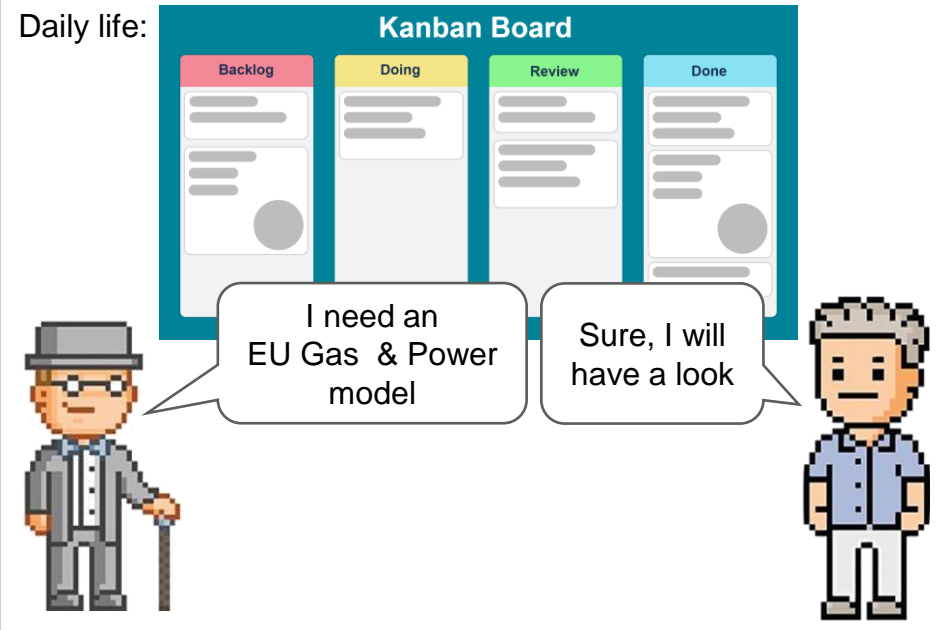What I think I do
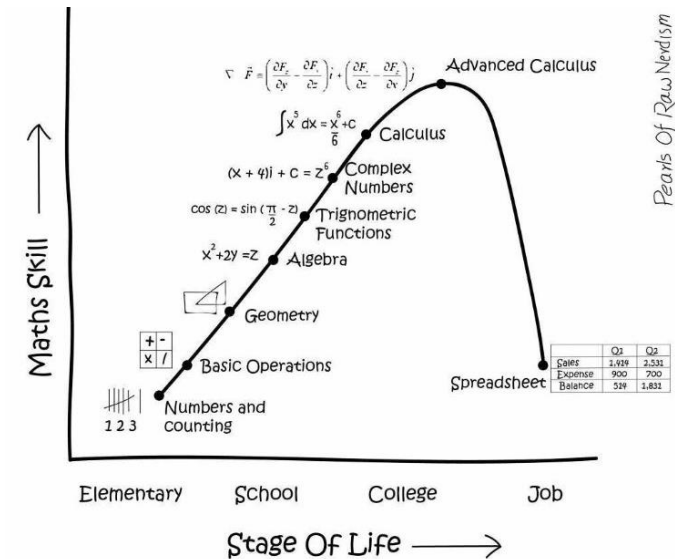
What I really do

Life in the Front Office

Typical day:

Coding, meetings, Rerunning models

Arriving to the office, model updates

Morning meeting with traders

Stand-Ups, meetings

Lunch

Leaving office

Market Open | EC00 weather run finished | EC06 weather run finished | Market Close | EC46 weather run finished

6:30am   7am   8am   8:30am   11am   12pm   2pm   4:30pm   6:30pm   9pm

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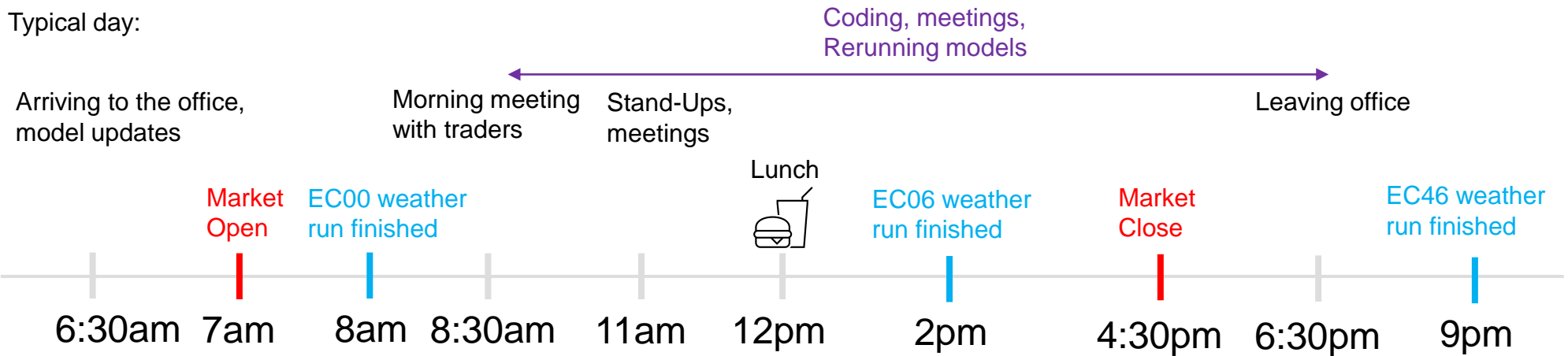
Yearly life:
- January – Peak winter, Ski trip
- February – High wind
- March – End of winter season, Bonus, Company Ski trip
- April – Start of summer season, first storage injections
- May – Summer heatwave warnings, Holiday no 1.
- Jun – Holding meetings
- July – Maintenance season starts, Holiday no 2.
- August – Peak summer, high solar – negative power prices
- September – FR strikes season
- October – Start of Gas year, start of winter season
- November – Seasonal weather forecasts, first cold spells, storage withdrawals
- December – Christmas/New Year low demand period, Holiday no 3.

Daily life:

Kanban Board

Backlog | Doing | Review | Done

I need an EU Gas & Power model

Sure, I will have a look

Use case 1: Building Gas S&D (Supply and Demand) model – Excel

https://gasdashboard.entsog.eu/
https://gas.kyos.com/gas
https://commodityessentials.com/
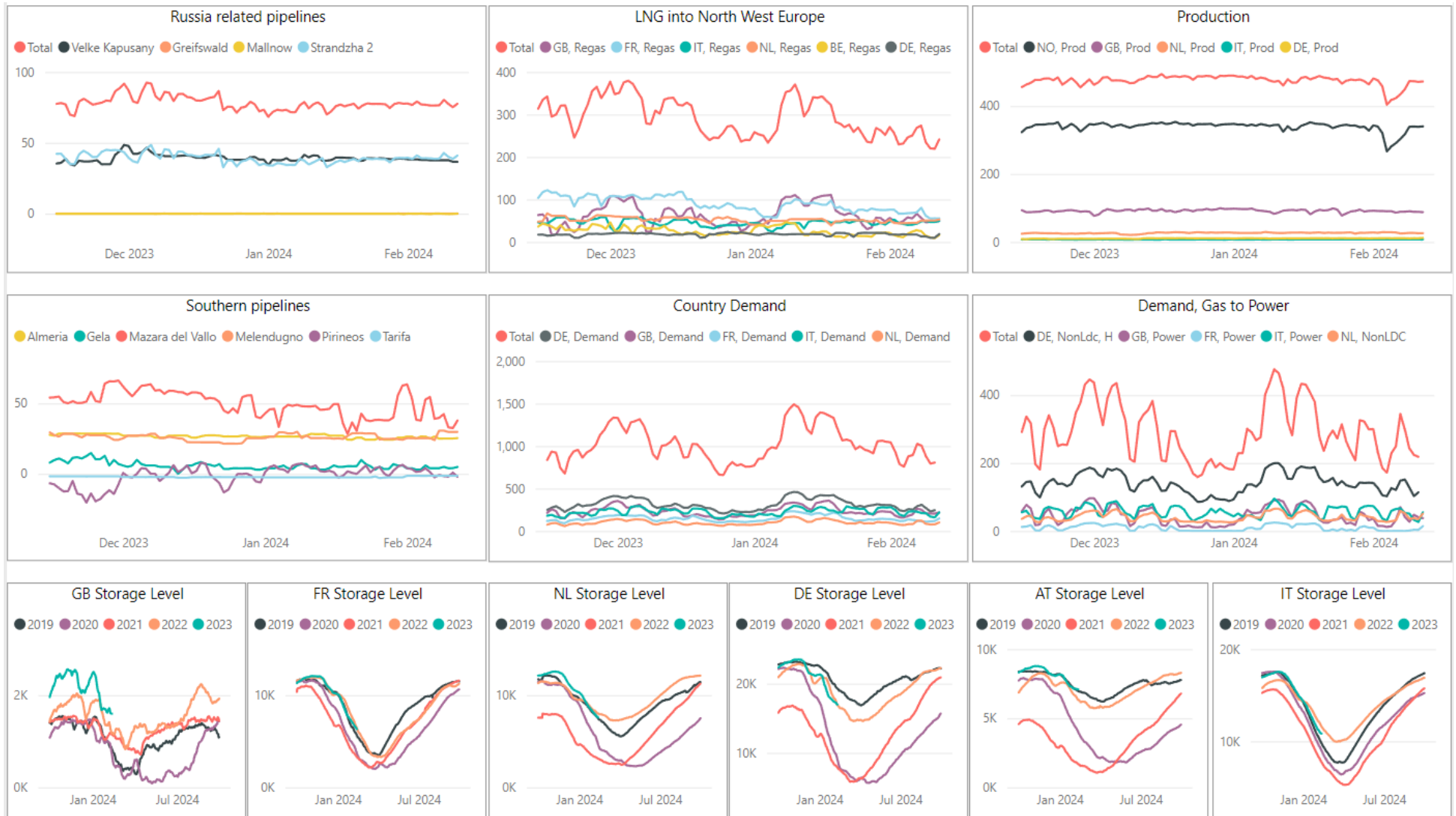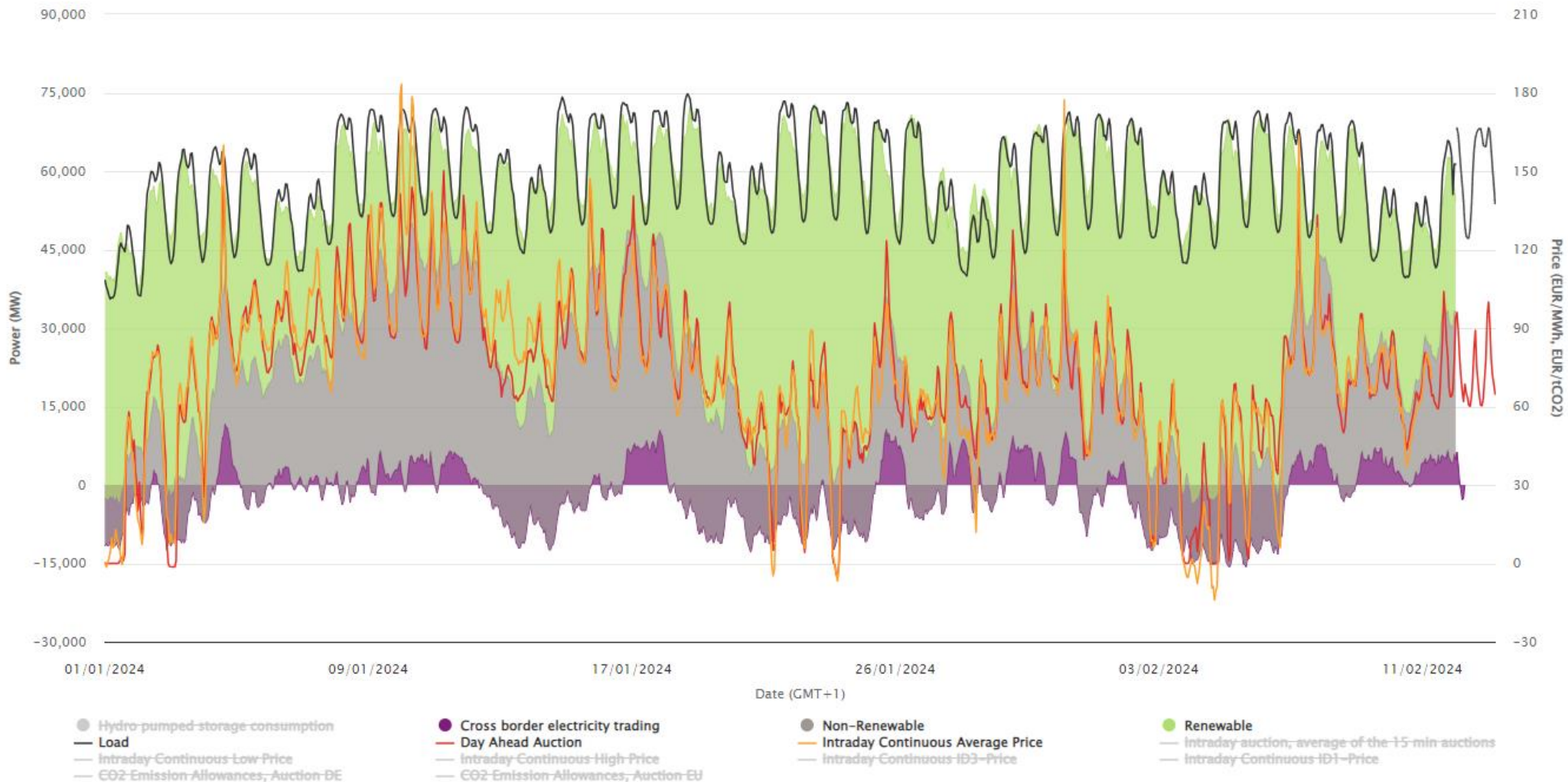
Use case 1: Building Gas S&D (Supply and Demand) model – Excel

"Tactical solution" / There are three ways to make a living in this business: **be first**; **be smarter; or cheat**.

External Data 1

External Data 2

…

External Data n

Excel spreadsheets
APIs
Excel connections
Excel Add Inns

Users
Can easily get data
Build models
But everything is "manual"

Office

WFH

SharePoint

Costs are almost nothing, not great reliability, great for prototyping
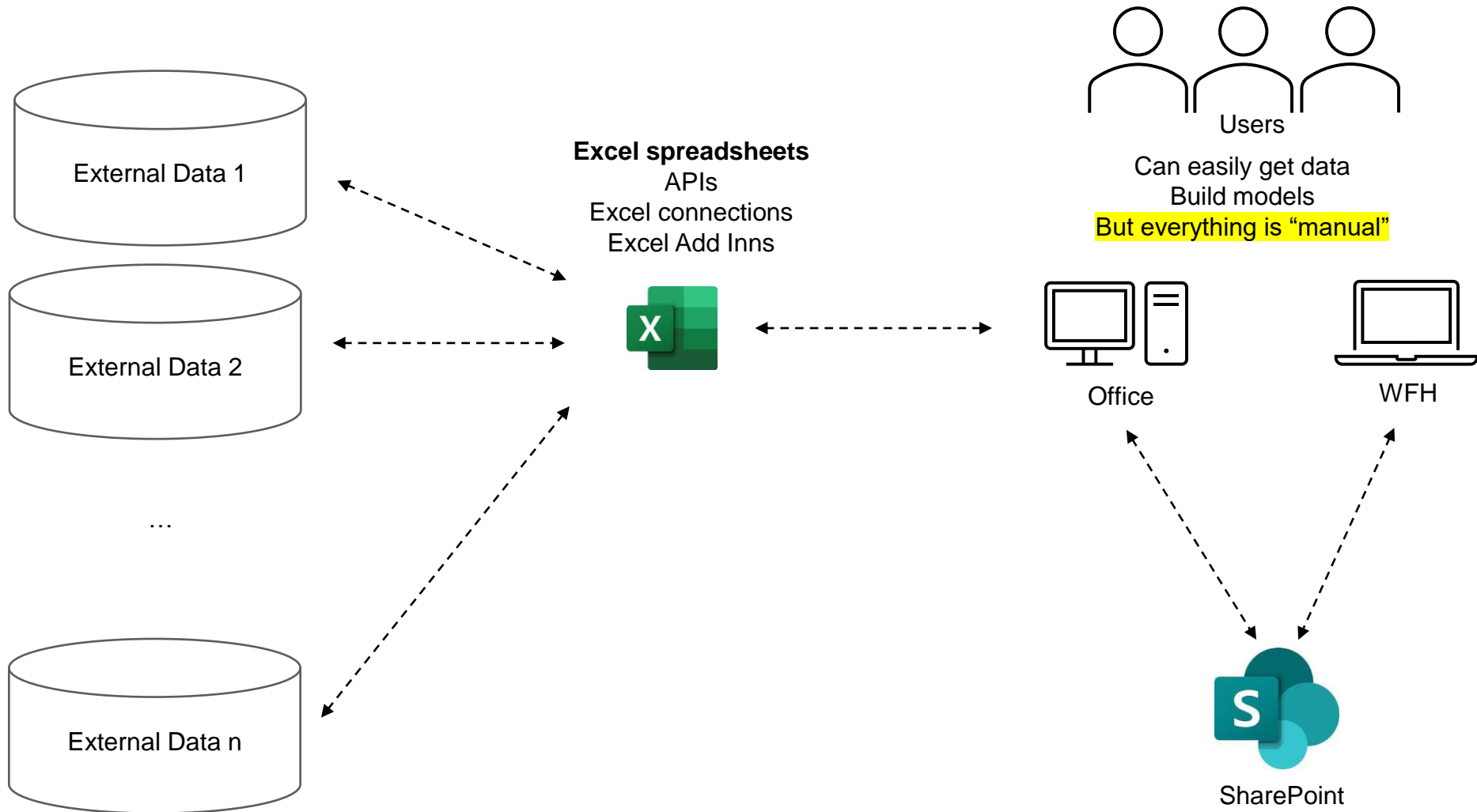
Use case 2: Building Power S&D model – Excel & Python

Electricity production and spot prices in Germany in 2024

https://energy-charts.info/charts/price_spot_market/chart.htm?l=en&c=DE&interval=year&year=2023&legendItems=011111110000000
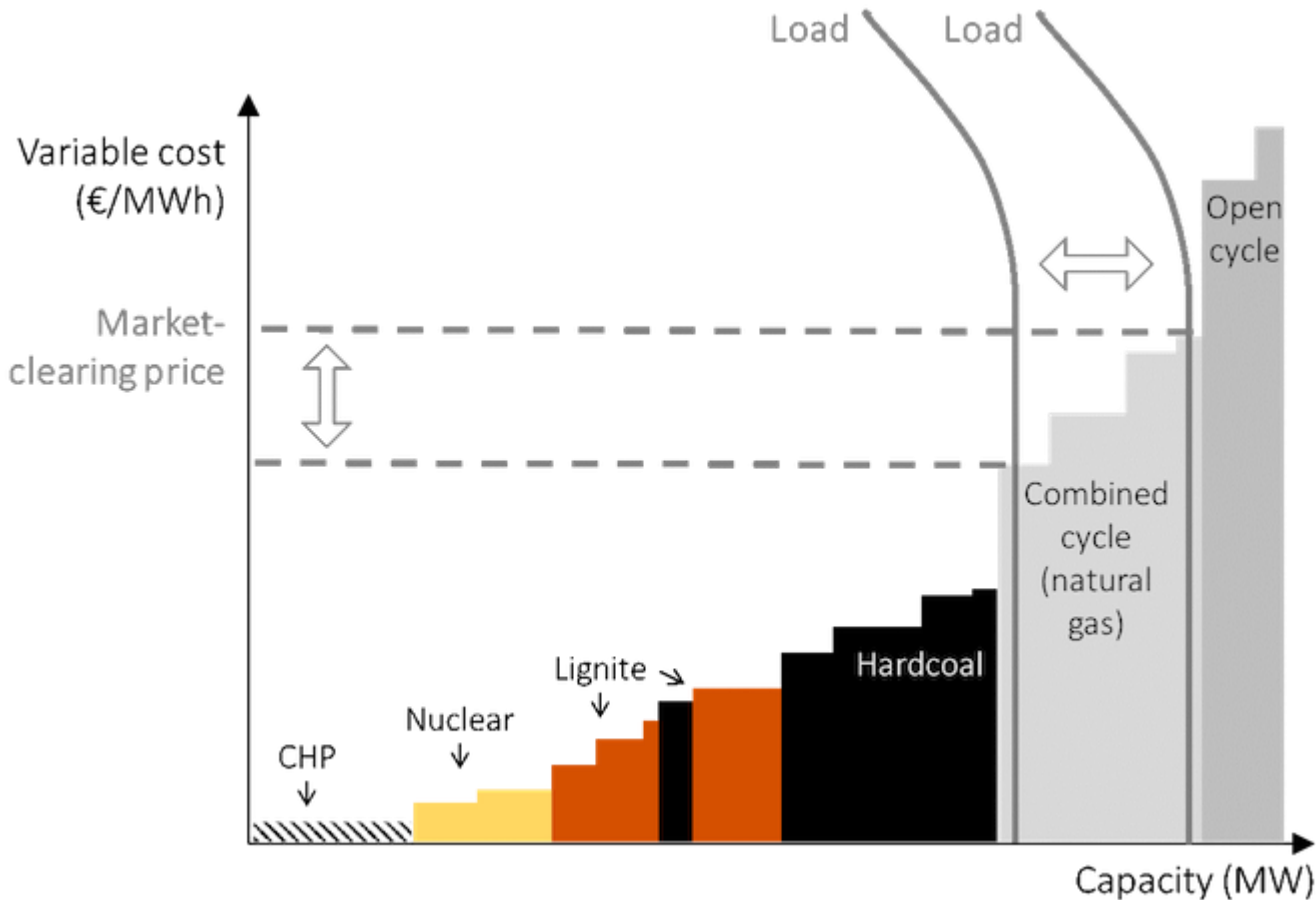
Use case 2: Building Power S&D model – Excel & Python

"Tactical solution" / There are three ways to make a living in this business: **be first**; **be smarter**; or **cheat**.

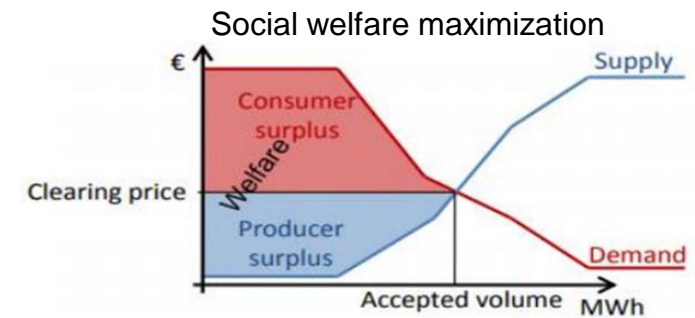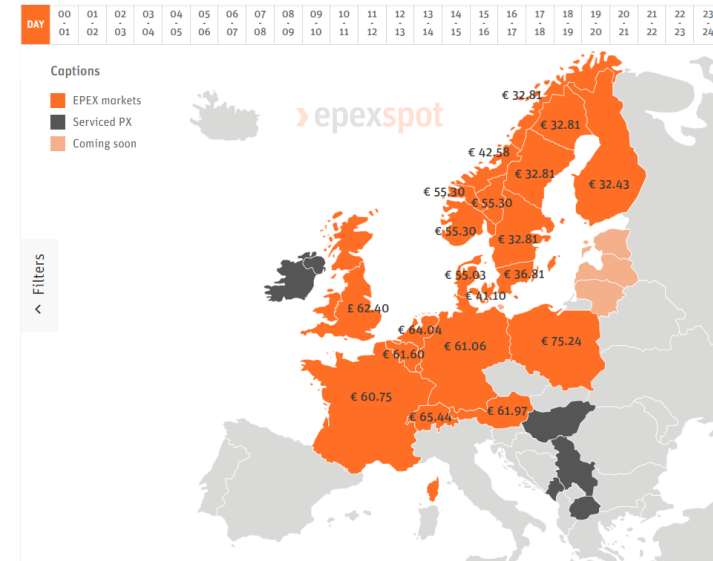Getting more complicated, better reliability, costs are going up
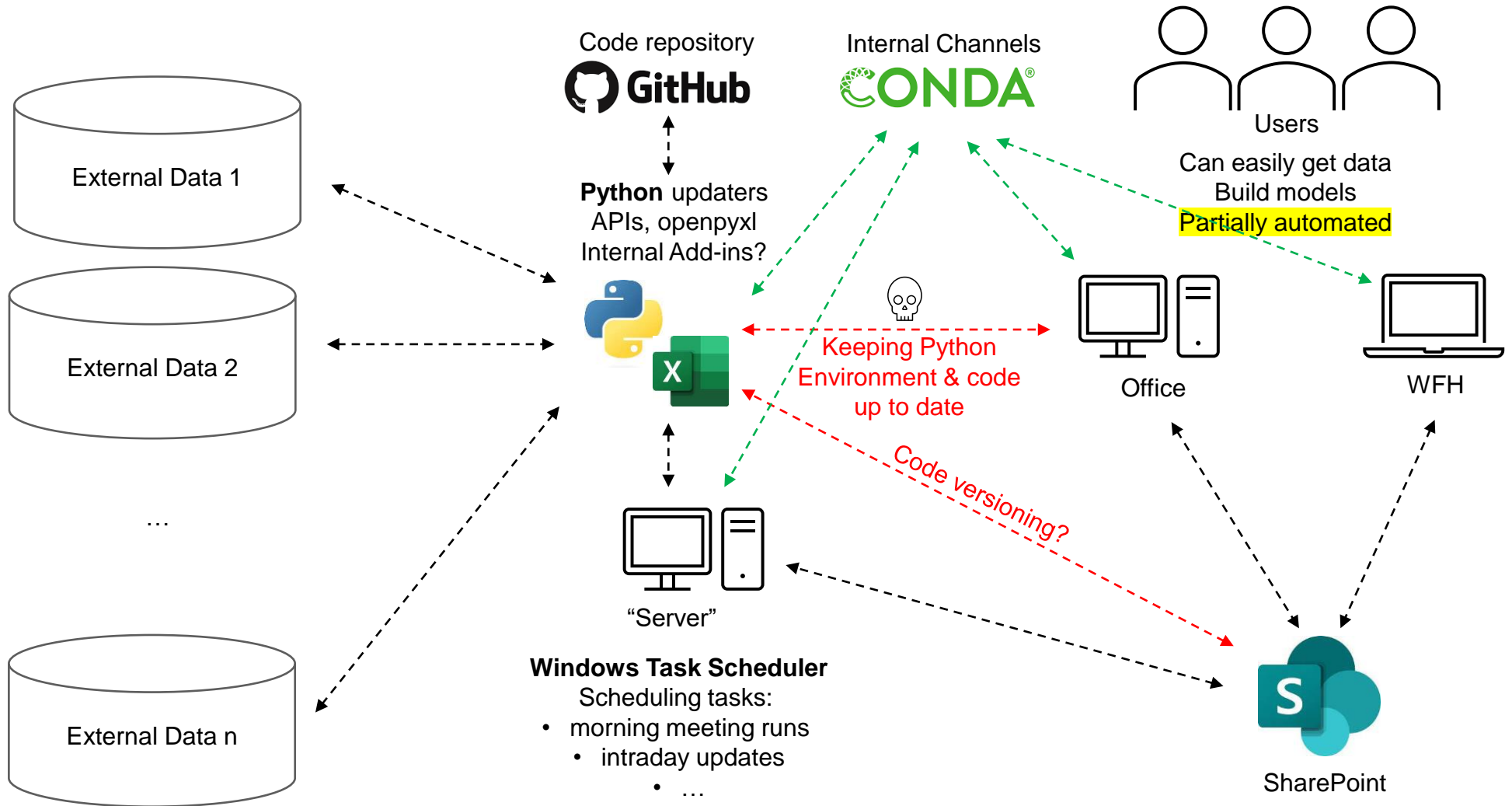
Use case 3: Building Power DA model – Cloud Based Python Analytics Platform

More countries, every hour

Social welfare maximization

Merit – order model: http://open-electricity-economics.org/book/text/04.html
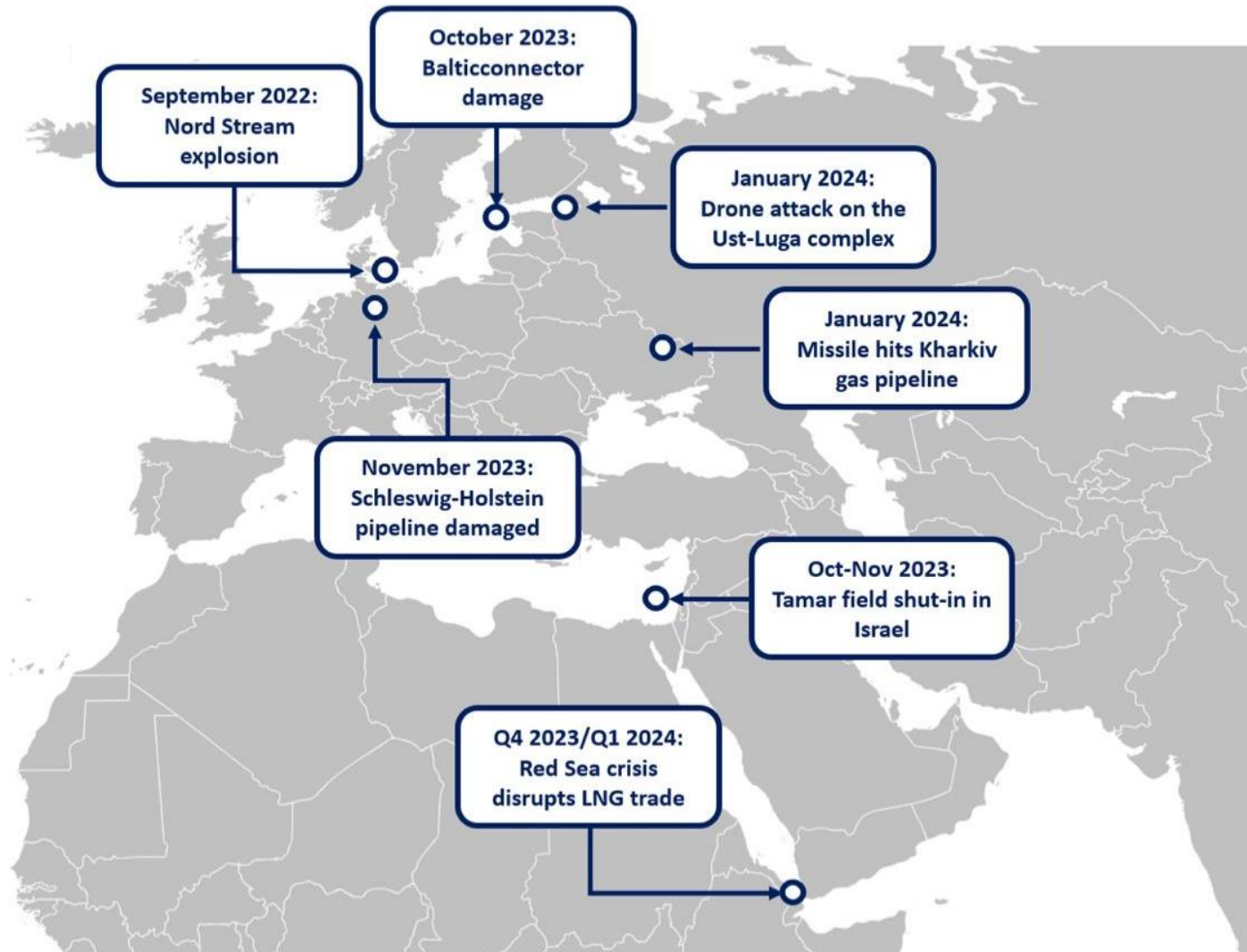EUPHEMIA Public Description: https://www.epexspot.com/sites/default/files/2020-02/Euphemia_Public%20Description_Single%20Price%20Coupling%20Algorithm_190410.pdf
Aggregated curves: https://www.epexspot.com/en/market-data

Stack for the Cloud Based Python Analytics Platform

Cloud Analytics Platform
Running analytics, controlling, trading & algo-trading models

Users

WFH — Both up to date ☠ — Office

Manual Install and Configuration

nexus repository
Internal Channels

CI/CD
PEP8 formatting
Testing
Tagging
Publishing packages to internal channels
Releasing on Could Platform

Devs

Client apps — Azure Load Balancer

CI/CD — Argo Update

Docker push — Azure Container Registry — Docker pull

Dev/Ops — Role-based access control — Azure Active Directory

Azure Kubernetes Service (AKS)
Azure Cosmos DB

Front end — Ingress — Namespace
Back-end services — Namespace
API Services — Web App — Namespace

Kubernetes cluster

SQL Database

Virtual network

Azure Key Vault — Service Bus

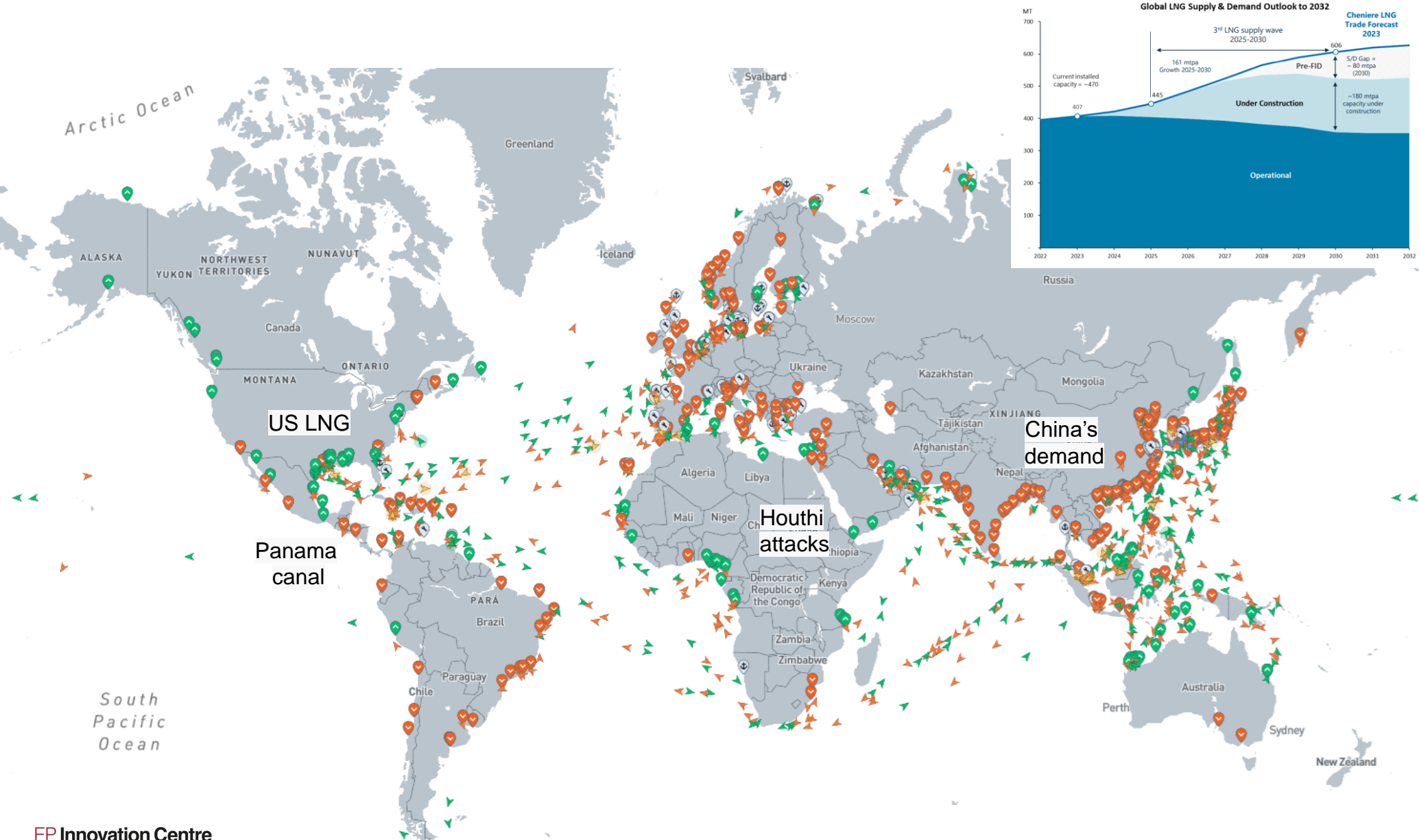Getting very complex, better reliability, costs high (cloud services, devs, devops, …)

Challenges and Future Trends in Commodity Trading

Bad Romance: gas infrastructure and geopolitics

LinkedIn: Greg Molnar, IEA

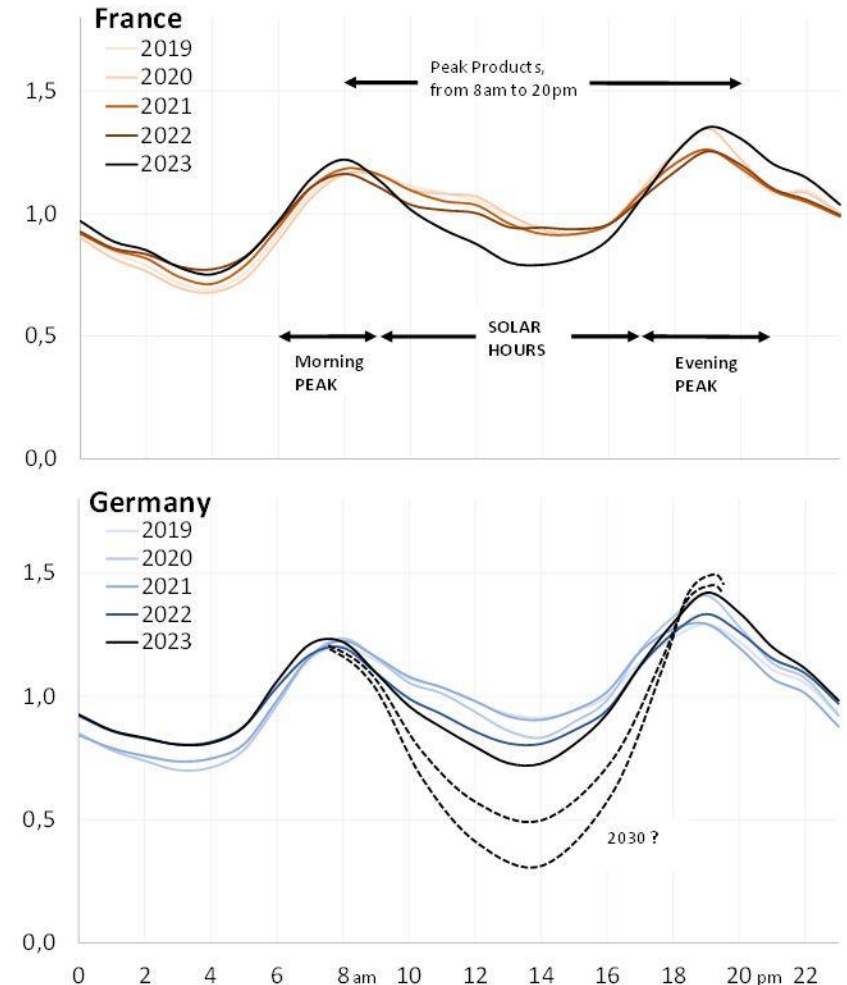# LNG and its growing importance in the Energy Markets

US LNG

Panama canal

Houthi attacks

China's demand

Global LNG Supply & Demand Outlook to 2032

Cheniere LNG Trade Forecast 2023

3rd LNG supply wave 2025-2030

Pre-FID

S/D Gap = ~ 80 mtpa (2030)

161 mtpa Growth 2025-2030

Current installed capacity = ~470

~180 mtpa capacity under construction

Under Construction

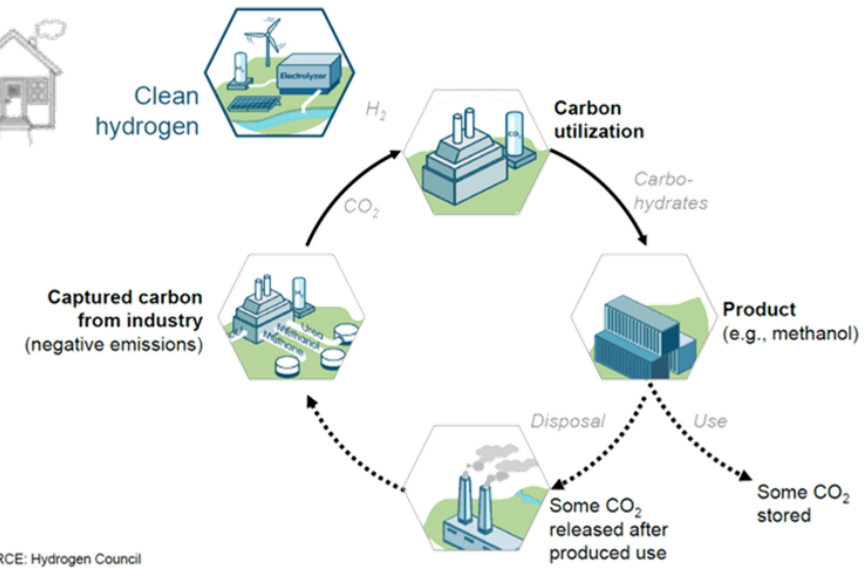Operational

Renewables - "Duck curve" problem, capture rates and cannibalisation
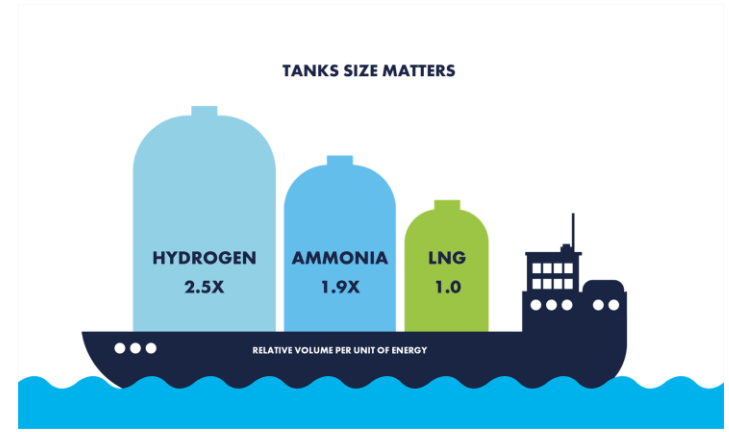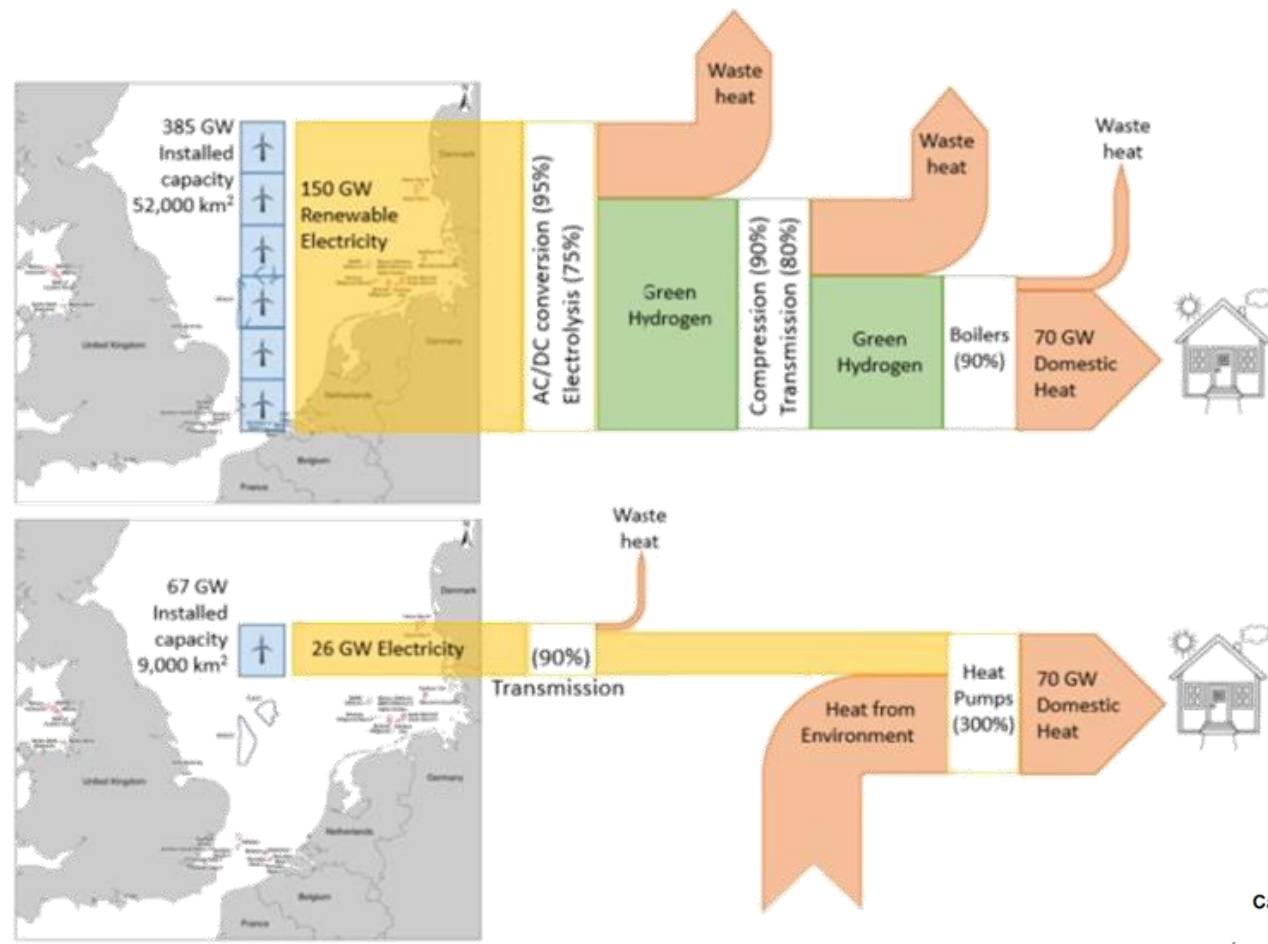

https://www.synergy.net.au/Blog/2021/10/Everything-you-need-to-know-about-the-Duck-Curve
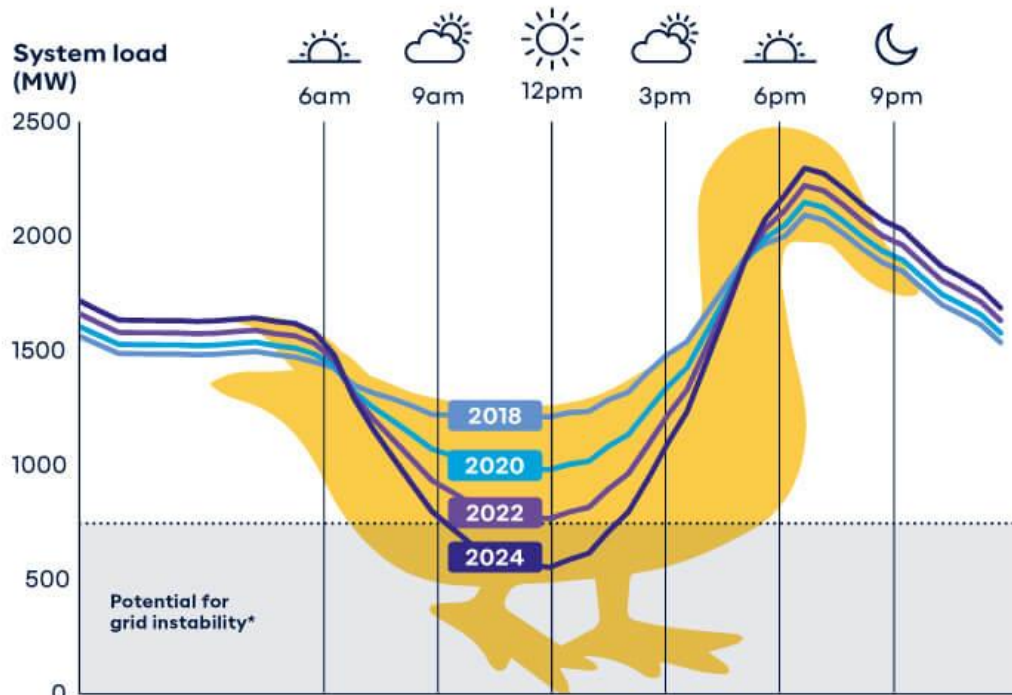
Impact of solar on electricity prices: https://gemenergyanalytics.substack.com/p/impact-of-solar-on-electricity-prices
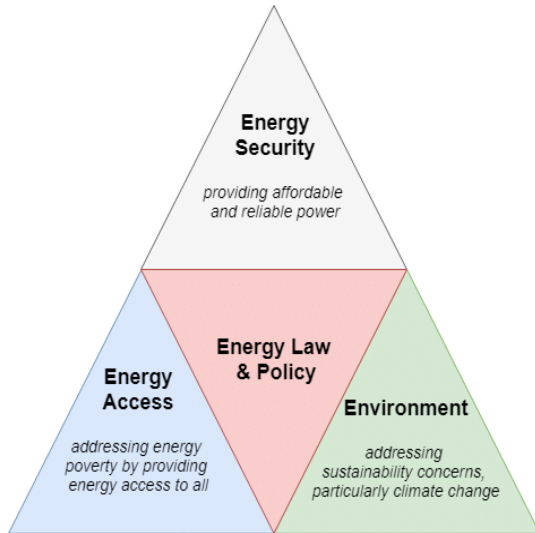Solar cannibalization: https://gemenergyanalytics.substack.com/p/solar-cannibalization-more-details

And many, many more …
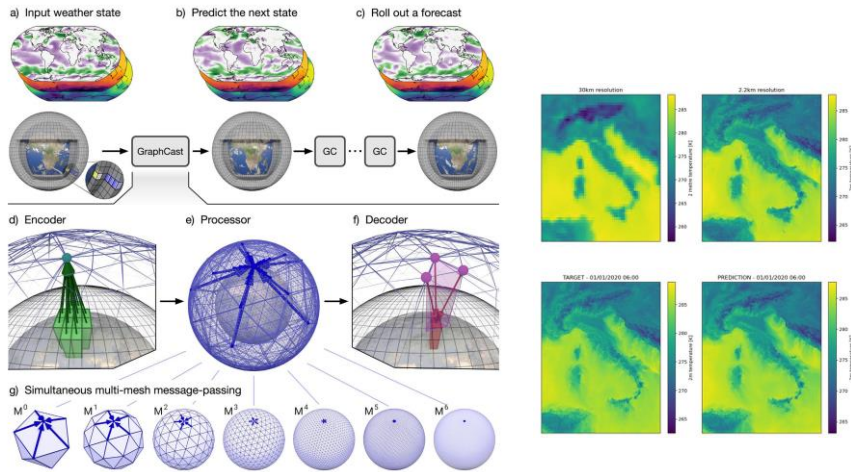
Machine learning weather models
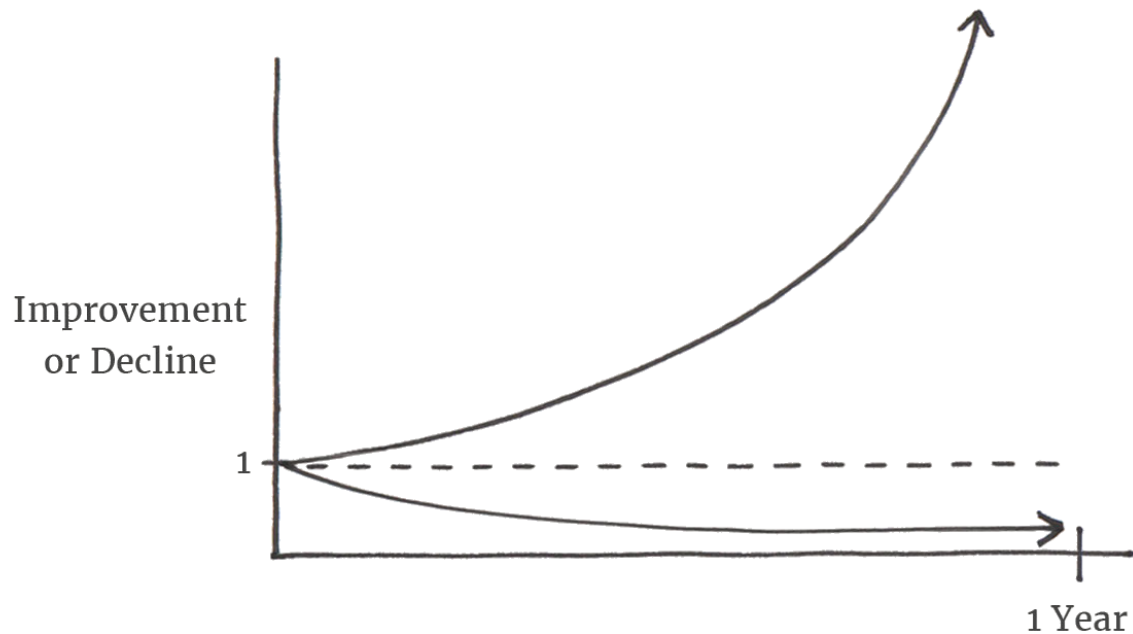

Net zero transition – S&D changes

Energy trilemma, quadrilemma …

Composite AI, analytics & algo-trading

The Power of Tiny Gains

1% better every day $\quad 1.01^{365} = 37.78$

1% worse every day $\quad 0.99^{365} = 0.03$


Improvement or Decline

1

1 Year

EP Innovation Centre - TECHNICOM

- **Enhancing Education and Research Quality**: Collaboration aims to elevate the quality of education and research at TUKE through innovative initiatives.

- **Skill Development in Commodity Market**: Provides a unique opportunity for students to acquire valuable skills in commodity market analysis and trading, fostering practical knowledge alongside academic learning.

- **Centre of Excellence - TECHNICOM Office**: TUKE hosts a Centre of Excellence where talented students can access the TECHNICOM office, equipped with excellent hardware and resources for hands-on learning.

- **Opportunities for Exposure**: Students have the chance to visit trading offices in Europe and the UK, gaining exposure to real-world trading environments and networking opportunities.

- **Empowering Talent**: The collaboration empowers talented students to excel by providing them with resources, mentorship, and opportunities to thrive in the field of commodities trading and analytics.

- **Interested? Contact us for more information.**

  - erik.kajati@tuke.sk

  - iveta.zolotova@tuke.sk

  - martin.miskuf@epcommodities.cz

In May 2023, the research and innovation center EPIC was inaugurated within the TECHNICOM facility

Captivating snapshots of university students exploring our London office in September 2023.
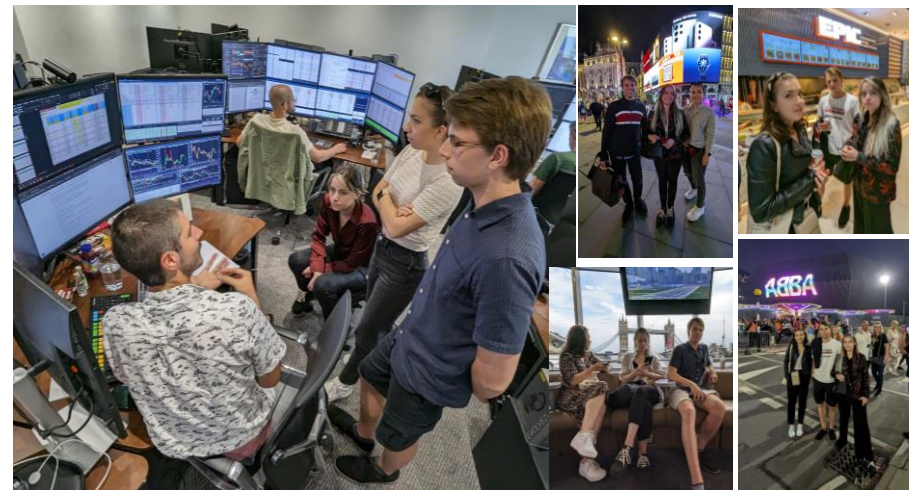
Homework

Margin call
Risk analyst

Shorting market
Derivatives - Options

Q&A and some useful links

- LinkedIn
  - Lion Hirth (Prof. energy study programme in DE): https://www.linkedin.com/in/lionhirth/
  - Gabriele Martinelli (Reuters power): https://www.linkedin.com/in/gabriele-martinelli-10bb1819/
  - Joachim Gessner (Bloomberg News): https://www.linkedin.com/in/joachimgessner/
  - Tom Marzec-Manser (ICIS Gas): https://www.linkedin.com/in/tom-marzec-manser/
  - Matthew Jones (ICIS Power): https://www.linkedin.com/in/matthew-jones-5a25862a/
  - Jonathan Howells (Market reports): https://www.linkedin.com/in/jhhowells/
  - Marcello Kolax (Tech Analysis): https://www.linkedin.com/in/marcello-kolax/
  - Stefan Feuchtinger (Emissions): https://www.linkedin.com/in/steffeuchtinger/

- EMBER: https://ember-climate.org/insights/
  - European Electricity Review 2024: https://ember-climate.org/insights/research/european-electricity-review-2024/

- BRUEGEL: https://www.bruegel.org/keyword/energy
  - European natural gas imports: https://www.bruegel.org/dataset/european-natural-gas-imports
  - Europe's under-the-radar industrial policy: https://www.bruegel.org/policy-brief/europes-under-radar-industrial-policy-intervention-electricity-pricing

- IEA reports https://www.iea.org/analysis?type=report
  - Electricity 2024: https://www.iea.org/reports/electricity-2024
  - Gas Market Report, Q1-2024 : https://www.iea.org/reports/gas-market-report-q1-2024

- Oxford Institute for Energy Studies: https://www.oxfordenergy.org/publication-topic/energy-insight/#

- Gas - ENTSOG: https://gasdashboard.entsog.eu/

- Power / Electricity - ENTSOE: https://transparency.entsoe.eu/

EP Innovation Centre – collaboration bc., Ing., PhD. Theses & Projects

❑ UK Analytics, Quant and Trading department will specify some projects which will be consulted with university.

❑ We can categorize tasks into 2 groups:

- Research projects (bc., Ing., PhD. dissertations)
  - Modelling energy markets using Composite AI
  - Energy security of Europe / Industry 5.0
  - Game-theoretic modelling of energy markets
  - Algorithmic trading
  - Neuro-Dynamic Programming
  - Structured convex quadratic programming models
  - Statistics of Extremes
  - Statistical Methods for Trend Detection
  - Numerical Solutions for Stochastic Differential Equations
- Engineering projects (Commercial projects)
  - Back testing & model tuning - Time expensive verification of models build by UK Quant and Analytics team
  - Building of POC (Proof of Concepts) for new technologies
  - Other MIMO (Most Ignored but Most Obvious) business challenges
  - Euphemia and SciPy vs Mosek – mixed integer problem

Gantt chart spanning years 22–28 (months 7–12, 1–12 per year) showing:
- PhD. Student
- PhD. Student
- PhD. Student
- Semestral Project | Master thesis | PhD. Student
- Semestral Project | Master thesis | PhD. Student